Conflicts over Land, Labor, and Rent

Essays on The Political Economy of Institutional Change

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To all those who showed me that Robinson has a slave.

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1 Tell Me What You Grow and I'll Tell You What You Think: Westward Expansion and the Politics of Slavery in the US South, with F. Masera

> You tell me whar a man gits his corn
> pone, en I'll tell you what his 'pinions is.
>
> Unnamed Slave, Missouri, 1850
> Mark Twain, *Corn Pone Opinions*

1.1 Introduction

Slavery has been a widespread and long-lasting labor institutions. Most of the ancient civilizations—Greece, Rome and Egypt, among others — as well as most of the colonial societies, regarded slavery as essential to their economies (Patterson, 1982; Acemoglu and Wolitzky, 2011). In these societies, slave labor was not only the primary productive input, but also at the core of the social order. The Southern US is one of the most prominent examples. Hinging on the labor of 4 million enslaved African Americans, it constituted, on the eve of the Civil War, "the greatest center of slavery in the New World and the bulwark of resistance to abolition" (Fogel, 1989 p. 34). The stability of this system rested on a broad consensus on political and social norms (Wright, 2006).

Yet, by the end of the 19th century slavery was abolished in most of the world. This institutional transformation was accompanied by ideological changes that challenged the morality of slavery itself. What accounts for these changes is still heavily debated. On the one hand, the rise of abolitionist movements and humanitarian ideas has often been regarded as the fundamental driver of the demise of slavery during the nineteenth century (Fogel, 1989). On the other, as pointed out by Williams (2014), the rise of these abolitionists movements shows a "curious affinity with the rise and development of new interests and the necessity of the destruction of the old."[1] According to this view, changes in economic incentives were a precondition for the social and institutional changes experienced by slave economies. In line with this argument, this paper shows that shifts in agricultural comparative advantages in the Antebellum US South determined changes in the political support for slavery. These changes occurred within a few decades despite the profoundly entrenched character of slavery in the US South.

We study changes in economic incentives to slave-ownership by analyzing one of the central aspects of the evolution of slavery in the US South: the Westward territorial expansion. While at the beginning of the nineteenth century, Southern states developed around the Atlantic shore, in the following decades, the Westward expansion shifted the epicenter of production toward the

[1] Williams, 2014, p. 211. The idea has recently been revisited by Wright (2020). See Fogel (1989) for the role of humanitarian sentiments in the demise of slavery.

Mississippi valley. At the same time, about one million slaves were forcibly moved throughout the South, profoundly transforming its economic landscape. This paper examines the impact of the Westward expansion on slave relocation and emphasizes a link between economic incentives to slave-ownership, and the political support for the institution of slavery. Our results show how the Westward expansion polarized the productive, political and social system in the US South, eventually determining the geographical distribution of the support for the secession.

Our strategy exploits two elements. First, the fact that the Westward expansion, between 1810 and 1860, implied a significant variation in the amount and type of agricultural land, inducing local changes in the incentives to crop production. Second, the fact that no more slaves could be introduced into the US after 1808. The abolition of the Atlantic Slave Trade (1808) implied that any change in the local number of slaves resulted from relocation within the US South.[2] We leverage these facts to compute changes in the county-level comparative advantage for the production of cotton relative to wheat and predict slave relocation. To establish a relationship between the comparative advantage in the production of cotton (vs. wheat) and the use of slaves (vs. free labor), we rely on the well-known empirical association in the US South between the intensity of cotton production and the use of slave labor (Wright, 1979; Fogel and Engerman, 1977) and provide evidence in favor of a specialization of slave labor in the production of cotton relative to wheat.[3]

We measure changes in comparative advantage in the following way. First, we use information on soil characteristics at the county level (FAO-GAEZ, 2002) to estimate the relative productivity of cotton with respect to wheat.[4] Second, we compute, for each decade, the changes in each county's position in the distribution of relative productivity determined by the addition of land due to the Westward expansion. The size of the change in the distribution depends on the relative productivity of each county compared to the newly established counties in the West. These heterogeneous changes capture the level of exposure of a county to the competition generated by the newly available land. We expect a larger drop in the distribution of relative productivity to be associated with larger changes in both the crop mix and the use of slave labor: an increase in wheat and a decrease in cotton production; a reduction in slaves.[5] We then show that these changes not only affected crop production decisions and local reliance on slave labor but also caused broader political and ideological transformation. Finally, we provide a quantification of the potential channels and rule

[2]The Abolition of the Slave Trade Act was voted on February 23, 1807 but became effective only from January 1st 1808. This was a consequence of the temporal limit established by the Constitution to the effectiveness of federal law in regulating matters relates to the Save Trade. Article 1 Section 9 of the Constitution establish that "[the trade] shall not be prohibited by the Congress prior to the Year one thousand eight hundred and eight [...]". Total number of slaves over total number of white people between 1810 and 1860 was 34% from 1810 to 1840, 33% and 32% in 1850 and 1860 respectively.

[3]Section A.1.11 of the Appendix, we provide evidence in support of the link between crop and the propensity to use slave or free labor and discuss the main hypothesis in the literature (Fogel and Engerman, 1974; Earle, 1978; Fenoaltea, 1984; Hanes, 1996; Wright, 2006). In section A.1.12.3 of the Appendix, we expand the analysis to include tobacco, sugar, and corn, other crops often associated to slavery.

[4]From now on, for ease of exposure, instead of writing "comparative advantage in the production of cotton with respect to wheat" we write "comparative advantage for cotton".

[5]Section 1.2.3 derives the relationship between changes in a county position in the distribution of relative productivity and the size of slave labor relocation.

out migration as the main mechanism. This shows that our results are at least partially due to changes in preferences and social norms.

The key identifying assumption behind our econometric model is the absence of unobservable county-specific and time-varying characteristics that affect the use of slave labor and are correlated with changes in the position of a county in the relative productivity distribution. To ensure and assess the validity of our identification, we take several steps. First, we control for county fixed effects, thereby absorbing all the time-invariant county characteristics that could potentially affect the number of slaves in a county and census year. Second, we include year fixed effects, which capture common changes brought by the Westward expansion. In this way, we only exploit the differential effect that the Westward expansion had on counties with different relative productivity of cotton with respect to wheat. We always control for the distance to the northern border (non-slave states) interacted with year fixed effects, and Census region fixed effect interacted with year fixed effects. Therefore, in our analysis, we always compare counties that are at the same distance from the North and in the same Census region but that differ in the extent to which the Westward expansion affected their agricultural comparative advantage. This specification allows us to net out potential effects derived from the evolution of the cultural and institutional environment that depend on counties' geographical position. For example, counties closer to the Northern border might be influenced by the changing northern ideological environment more than counties further away.

We then estimate a series of alternative specifications. First, we compute changes in comparative advantage by exploiting national changes in the prices of labor inputs (wages and slave price) and agricultural outputs (cotton and wheat prices) as a source of time variation. We show that as the cost of producing cotton increased, counties with lower relative productivity adjusted crop production and decreased their share of slaves. Second, we include sugar, tobacco, and corn in our analysis, the other main cash crop of the Antebellum south. Third, we exploit the fact that the timing of the effect of the Westward expansion was not the same for all crops. We then show that our estimates are robust to restricting the analysis to the sample of counties belonging to the US in 1810 and also only to counties formed during the Westward expansion. Finally, we allow for different trends depending on the share of slaves before the end of the Atlantic slave trade (1808), when the amount of slave labor available was not restricted.

In the first set of empirical results, we look at the effect of agricultural shocks on slave relocation and production decisions. We find that when a county loses comparative advantage in the production of cotton, it reduces the use of slave labor. A county that in 1810 had a median relative productivity experienced a substantial loss in comparative advantage between 1810 and 1860. Over this period, almost 1 million squared kilometers of land with higher relative productivity was added. Due to the competition generated by the new land, this county experienced a 10.7 percentage points reduction in the share of the enslaved population. This reduction is substantial when taking into account that the average share of the enslaved population was 28%. Overall, our estimates imply that between 1810 and 1860, almost 800,000 slaves were relocated due to the competitive forces generated by the

Westward expansion.

Exploiting information in the Census of Agriculture — available for 1840-1860 — we show that these results are associated with changes in crop production. As expected, we show that counties that lost comparative advantage reduced their production of cotton and increased their production of wheat. A county that in 1840 had a median relative productivity of cotton with respect to wheat experienced a 71% reduction in the production of cotton and a 58% increase in the production of wheat between 1840 and 1860 due to the loss in comparative advantage.

Next, we study the effects of changes in economic conditions on the politics of slavery. Our results show that the frontier expansion led to a political polarization of geographical regions. To show this transformation, we analyze two newly collected datasets: Legislators' voting behavior for all the 222 votes regarding slavery held in the history of the House of Representatives and voting behavior by the secession convention delegates to ratify the Ordinance of Secession for 9 secessionist states. We show, in both instances, that changes in the local comparative advantage in the use of slave labor influenced the politics of slavery. A congressman that in 1810 was representing a congressional district with a median relative productivity of cotton by 1860 doubled the probability of voting against slavery in Congress due to the loss in comparative advantage in cotton production. These large changes in the voting behavior regarding slavery are present even when comparing legislators' behavior with the same party affiliation. When studying the secession conventions, we are constrained by the cross-sectional nature of the data. After controlling for many observable characteristics of the local agricultural sector, manufacturing sector, and religious affiliation, we find that a one standard deviation increase in the relative productivity of cotton with respect to wheat increases the likelihood that a county voted in favor of secession by 11 percentage points. This result is particularly striking given that in all but 3 states, the secession conventions were decided by less than 10 percentage points.

We then study how changes in agricultural comparative advantage determined broader changes in the political equilibrium by looking at parties' vote shares and legislators' roll call voting behavior (using the DW-Nominate score). To discipline our analysis, we show that the Southern sections of the two main parties (Democrats and Whig)[6] behaved differently when voting on slavery. Our estimates show that southern members of the Whig party were consistently more willing to compromise on slavery. With these party differences in mind, we use county-level electoral returns to study how economic conditions affect not only the politics of slavery, but the political landscape more broadly. Counties that lost comparative advantage in the use of slave labor saw a decrease in the share of votes for the Jacksonian\Democratic party both in the presidential and gubernatorial elections. In a county with median relative productivity in 1828, the vote share in favor of these parties dropped by 12 percentage points between the 1828 and the 1860 elections due to the loss in comparative advantage. The effect is large if compared to the average Democratic share of 54%. We then examine the full roll-call history of all Congressional representatives to study the ideological transformation of elected

[6]Democrats and Whig were preceded by the Jacksonian and Anti-Jacksonian parties

members of Congress. We show that congressional districts that lost comparative advantage in the use of slave labor were represented by legislators more ideologically distant from the Democratic party and closer to the Whig party, independently on their actual party affiliation. This result is both due to the selection of new politicians and to changes in the voting behavior of re-elected representatives.

In the last part of our empirical analysis, we examine the transformation of the public debate on slavery, studying newspapers' behavior; and changes in social norms, studying patterns of the free black population. We first create a unique dataset of 282 Southern local newspapers spanning from 1810 to 1860, which include approximately 2.6 billion words. Using text analysis techniques, we investigate changes in the narrative related to slavery. We build on Gentzkow and Shapiro (2010) to model newspapers' supply of ideological content. There are two key ingredients to the model: first, because readers have preferences for like-minded newspapers, outlets minimize the distance between their ideological slant and the preferences of their potential readers. Second, partisan newspapers cannot change their political position on a given topic but can strategically modify its level of supply to move toward the reader's preferences. Under these conditions, a partisan newspaper located in an area were citizens become less pro-slavery reacts by modifying the supply of content related to slavery. We expect a newspaper affiliated to a pro-slavery party to reduce their supply of slavery-related content as its position on the topic become less aligned with the preferences of potential readers. Partisan newspapers affiliated with political parties more critical towards slavery should instead increase their supply of content related to slavery. With these theoretical predictions at hand, we show that changes in agricultural comparative advantage imply different underlying ideological patterns. The empirical analysis shows that pro-slavery newspapers decreased the discussion of slavery-related topics when located in an area losing comparative advantage in the use of slave labor. The effect is the opposite in the case of newspapers on the other side of the political spectrum.

Finally, we show results on the dynamics of the free black population. Our estimates show that places that lost comparative advantage in the use of slave labor experienced an increase in free blacks. This is consistent with several interpretations. On the one hand, free blacks might have chosen to move in places where slavery was declining, seeking economic opportunities. On the other hand, because free blacks were considered a threat to the institution of slavery, an increase in the number of free blacks can be interpreted as a decline in social norms in support of the institution.

We conclude with a discussion of the potential mechanisms behind our results. We show that our findings cannot be fully explained by slave-owners migration. We estimate that the upper-bound of the change in voting behavior that can be explained by slave-owner migration is 30%. The rest of the effect must be due to other mechanisms. We propose two complementary interpretation. First, the idea that the local decline of a slave-based economy reduces incentives to patronage for the local planters. This, in turn, relaxes local constraints to political behavior and might lead to a decline of the social norms in support of slavery. Second, we rely on the theory of cognitive dissonance (Festinger, 1957) to argue that a decline in the incentives for slave-ownership might have reduced

individual commitment to pro-slavery.

Taken together, our results show that the Westward Expansion generated polarization of the productive, political and social system within the US South. As the frontier moved to the West, some counties lost comparative advantage in cotton production others gained it. These differences in the productive system led to diverging political forces and narratives over slavery eventually shaping the coalition that ultimately led to the Secession from the Union. These findings are consistent with an economic tradition that sees changes in the economic condition as the basis for political and institutional transformation.

With these results, we contribute to a classic debate in social science on the role of the relationship of production in shaping institutions and ideology. Karl Marx has famously proposed a view in which material conditions determine both the political and ideological structure of society: "It is not the consciousness of men that determines their existence, but their social existence that determines their consciousness."[7] More recently a similar approach has been interpreted by the Chicago school — "Marxian in spirit, but without class-struggle"[8] — where Becker and Stigler (1977) treated consumer's preferences as endogenous and by North (1990) who maintained that relative prices determine both institutional change and preferences: "fundamental changes in relative prices over time will alter the behavioral pattern of people and their rationalization of what constitutes standards of behavior."[9] Very close to our interpretation, Greif (1994) has explicitly pointed to mechanism of motivated cognition to explain how changes in economic conditions can affect value systems: "different patterns of social and economic interactions lead to the development of distinctive value systems as individuals attempt to find moral justification for their behavior through cognitive dissonance."[10] Our paper contributes to the effort to substantiate this historical and theoretical perspective.

In a related literature, several papers have studied the deep origins of culture and institutions (Nunn and Wantchekon, 2011; Alesina et al., 2013; Grosjean and Khattar, 2019), mechanisms of persistence (Bisin and Verdier, 2001), and their causal effect on economic outcomes (see Guiso et al., 2006, Guiso et al., 2015, and Giavazzi et al., 2019 among others). On this front, our analysis, instead, is closer to a relatively small literature that has engaged in the study of the short term effects of technological innovations and changes in the economic environment on institutional and ideological equilibria. Greenwood et al. (2014) look at the role of contraception in determining changes in attitudes toward premarital sex; Doepke and Zilibotti (2008) and Doepke and Zilibotti (2017) study models of cultural transmission where forward-looking parents socialize their offsprings to the optimal cultural traits given the changing economic environment. Di Tella et al., 2007 shows that land squatters randomly granted property rights adopted more "pro-market" beliefs, relative

[7] Preface to a Contribution to the Critique of Political Economy, 1859. In Marx, 1977.
[8] Guiso et al., 2006, p. 27
[9] See North, 1990, p. 84.
[10] See Greif, 1994, p. 917. Other important contributions to this literature include (Akerlof and Dickens, 1982; Kuran, 1993; Rabin, 1994; Bowles, 1998; Bénabou and Tirole, 2002; Benabou and Tirole, 2006; Di Tella et al., 2007; Di Tella et al., 2015a; Bénabou, 2013; and Bénabou and Tirole, 2016)

to their less-lucky neighbors. In a more historical setting, Becker and Pascali (2019) argues that the Protestant Reformation opened up competition in sectors previously dominated by Jews, leading to an increase in anti-Semitism and Bazzi et al. (2017) shows the effect of the material conditions embedded in the US frontier on individualism. In the same spirit, our analysis shows that a decrease in the economic importance of the institution of slavery led to a decrease in the prevalence of pro-slavery attitudes captured by changes in several types of political and ideological measures.

Our paper also contributes to an extensive literature on the economics of US slavery. The bulk of these studies focus on the profitability of investments in slaves and the relative efficiency of slave and free labor.[11] This debate was intertwined with the problem of slave labor sector specialization. A plurality of competing hypothesis were proposed — gang labor (Fogel and Engerman, 1974), seasonality of labor requirement (Earle, 1978), risk diversification (Wright, 1979), effort intensity (Fenoaltea, 1984), scale effects (Irwin, 1988), turnover costs (Hanes, 1996).[12] Building on this literature, we propose a new approach and show the link between agricultural comparative advantage and slave labor allocation. By studying the effect of the Westward expansion on slave relocation, we also complement the research on the ability of the southern economy to efficiently relocate resources in response to changes in demand and the technology of production. Our estimates suggest a lower-bound of 30% for the movement of slaves through trade. Tadman (1989), Pritchett (2001) and, Steckel and Ziebarth (2013) have quantified the movement of slaves and provided estimates for the Interregional Trade. Consistently with our findings, most of the estimates in the literature are in the range between 50 and 70%.

Finally, our paper contributes to the literature on the politics of slavery. The sources of political and ideological support (and opposition) to the institution of slavery in the South has been the object of several studies. While there exists a large qualitative literature,[13] quantitative analysis are relatively scarce. Calomiris and Pritchett (2016) study slave price fluctuations and news in the month preceding the Civil War; Chacón and Jensen (2019) show that counties with more slaveholders and planters were systematically overrepresented in the secession conventions; Hall et al. (2019) show that slave-owners were more likely to volunteer for the confederacy; González et al. (2017) study the role of slave property as a source of collateral before and after emancipation in Maryland. There is instead a rich literature on the long term effect of slavery both inside and outside the US.[14] In particular, Acharya et al. (2016) study the long term effects of slavery on political preferences. They show that the number of emancipated slaves in 1870 explains 21st century political preferences.

The rest of the paper is organized as follows. Section 2 introduces the historical background and

[11] The literature is too ample to be surveyed here. Among others, relevant contributions are Conrad and Meyer (1958), Yasuba (1961), Fogel and Engerman (1974, 1977, 1980), Fogel (1989), Wright and Kunreuther (1975); Wright (1975, 1978, 1979, 2006), David and Temin (1979), Schaefer and Schmitz (1979), Haskell (1979).

[12] More recently Esposito (2018) studied the role of Malaria in the rise of slavery in the 17th and 18th century.

[13] Stampp (1943), Wooster (1958), Hammond (1974), Genovese (1975, 1989), Cooper (1978), Crofts (1989) Budros (2005), Fox-Genovese and Genovese (2008), King and Haveman (2008)

[14] Nunn (2008) on economic development; Bertocchi and Dimico (2014) income inequality; Baiardi (2018) gender division of labor; Bertocchi and Dimico (2019) family structure; Jung (2019) human capital. Dell (2010), Acemoglu et al. (2012); Bobonis and Morrow (2014); Fujiwara et al. (2019) for studies on Latin America. Buggle and Nafziger (2018) and Markevich and Zhuravskaya (2018) for the Russian Empire.

discusses the relationship between slave labor allocation and the choice of crops. Section 3 presents the data. Section 4 lays out the empirical strategy. Section 5 studies the effect of the Westward territorial expansion on crop mix adjustment and slave labor allocation. Section 6 investigates the political consequences of changes in agricultural comparative advantage. Section 7 studies the effects on the supply of slavery-related content by newspapers and the changes in the free black population. Section 8 discusses the potential mechanisms that relate changes in economic incentives to our political and ideological results. Section 9 concludes.

1.2 Historical Background and Slave Labor

1.2.1 Agriculture and Slavery in the US

During the period of our analysis, 1810-1860, slavery was a controversial institution, abolished in the Northern States, and widely used as labor factor in the southern agricultural economy. The number of slaves available to the southern economy was of about one million people in 1810 over a total population of fewer than three million people. The proportion has been roughly stable, with a slave population of four million people in 1860 over a total southern population of twelve million. The US economy was highly rural, even in the last period of our analysis. For the whole US, in 1800 and 1860, the agricultural sector employed over 74% and 55% of the labor force and accounted for around 45% of 1860 total output (Weiss, 1992). The Southern economy was even more markedly rural, as reflected in the low number of its urban population who never surpassed 8% before the end of the civil war. The main economic activities consisted in the production for the market of few cash crops in which slave labor was both the major capital investment and an important labor input, North (1961). The most relevant product within the Southern economy was cotton, which accounted for 38% of the total agricultural value in 1860, followed by sugar (30%), corn (27%), wheat (8%) and tobacco (5%).[15]

The slave labor needed for agricultural production was organized through a slave market which grew to maturity after 1808, when the Atlantic slave trade was officially ended, impeding the legal introduction of new slaves from abroad. Between 1810 and 1860, about one million slaves were relocated throughout the US South (Tadman, 1989, Pritchett, 2001 and Steckel and Ziebarth, 2013),[16] both through the interstate trade and through slaveowners migration. The trade was conducted by professional agents who would purchase slaves through public auctions or advertisements and sell them to the South-western regions.

The Antebellum is a period of profound transformation in the structure of the southern economy, characterized by a sharp increase in agricultural output and a shift of production to the West; between 1810 and 1850 the "cotton crop increased nearly tenfold and the share of the western states

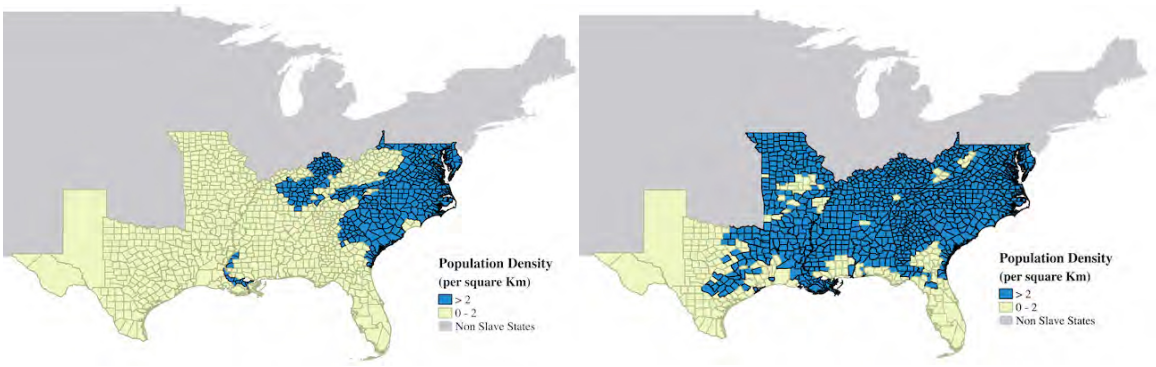
[15] Own computation from the Agricultural Census of 1860. Total agricultural value is given by the sum of crop, orchard, and market garden values as reported in the Census, (Haines and ICPSR, 2010).

[16] On the relative importance between trade and slaveowners migration in the movement of slaves we refer to Tadman (1989), Pritchett (2001) and Steckel and Ziebarth (2013). Different estimates suggest that trading outweighed planters' migration by numerical importance, accounting for more than 50% of the overall movement of slaves.

leaped from 7 to 64 percent" (Fogel, 1989 p. 64). Cliometricians have shown that the southern economy experienced a period of sustained growth. Fogel (1989) estimated a rate of growth in per capita income of 1.7 percent in the period between 1840 and 1860 which - the author maintains - not only was one third higher than the Northern one but also quite high for historical standards.

During this period, a major transformation reshaped the Southern landscape: the increase in the land available for agricultural production through the Westward expansion of the frontier. Between 1810 and 1860, the inhabited land increased by three times in the southern States and led to a major shift in the geographical position of the best land for cotton production toward the West. Although international cotton demand grew at approximately 5% per year from 1830 to 1860 (Wright, 1975)), cotton price steadily decreased over this period while slave price steadily increased. Figure 22 shows the expansion from 1810 to 1860.[17] Figure 2 panel (a) shows the distribution of relative productivity of cotton and wheat of the inhabited land in 1810 against the one of the land inhabited between 1820 and 1860; panel (b) shows prices of cotton and slave over time.

Figure 1: Westward Territorial Expansion



(a) Inhabited Land in 1810

(b) Inhabited Land in 1860

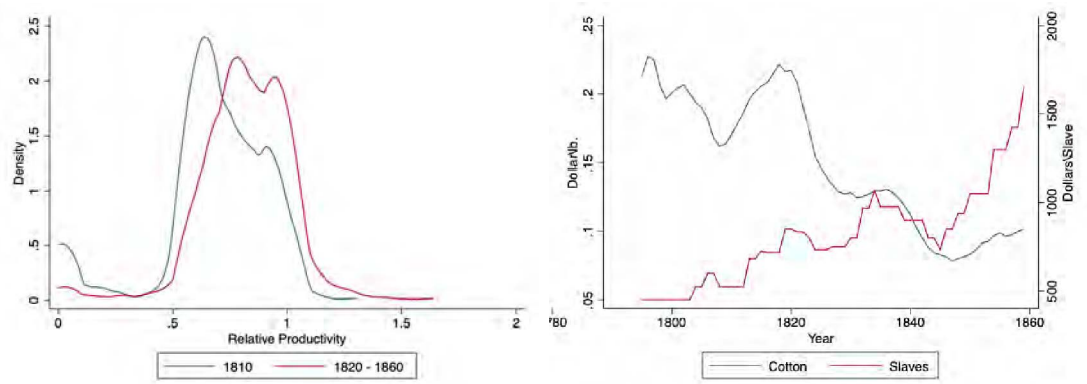
The Figure represents the Westward territorial expansion in the South US between 1810 and 1860. Blue counties have a population density higher than 2 individuals per squared Km. Yellow counties have a population density below 2 individuals per squared Km and represent the Southern territory in 1860. The gray area represent the non Slave Staes. *Source: NHGIS and ICPSR.*

[17] Figure 22 in Appendix A.1.16 shows the Westward expansion decade by decade, from 1810 to 1860.

Figure 2: Change in Comparative Advantage

(a) Relative Productivity

(b) Prices of Cotton and Slaves



The figure on the left plots the distribution of relative productivity of the counties inhabited in 1810 against the one of counties that became inhabited during the period 1820-1860. The figure on the right plots 10-years moving average of cotton and slave prices. Cotton prices is for the New Orleans market, in Cole (1938). Slave prices are from Phillips (1905).

1.2.2 The Choice of Labour Inputs: Slavery *vs.* Free Labor

That a large share of slaves in the US South was employed in the cultivation of cotton is hardly a controversial statement. In 1860, the average share of cotton in the gross value of farm output varied from 29 percent on slaveless farms to 61 percent on plantations with more than 50 slaves (Wright, 1979; Fogel and Engerman, 1977).[18] The relationship is reversed in the case of wheat, with slaveless farms producing 5 times more wheat than plantations with more than 50 slaves. Nevertheless, what accounts for such specialization, and more generally for the heterogeneous distribution of slaves across sectors in colonial and Antebellum America, has been the object of extensive debate.

Different theories have been proposed to explain these patterns of specialization. The idea that certain crops were better suited to the use of gang labor techniques (Fogel and Engerman, 1974; Fenoaltea, 1984) and effort-intensive tasks (Fenoaltea, 1984); the inherent riskiness in the production of non-food cash-crops (Wright and Kunreuther, 1975; Wright, 1979); the number of weeks in a year a crop needs to be attended for (Earle, 1978), and the number of peaks of the labor requirements in a year (Hanes, 1996). In Appendix A.1.11, we provide a more detailed discussion of these theories and their implications.

Whether the heterogeneous distribution of slave labor can be explained by one or a combination of several arguments, revealed preferences show that slave labor was preferred to free labor in the production of cotton. The opposite seems true for wheat. Using farm level information from the

[18] In the same year 75% of the enslaved population lived in counties that produced more than 1000 bales of cotton.

Gallman and Parker (1976) subsample of the 1860 US Agricultural census, we observe two main patterns: first, the negative correlation between wheat and cotton at the farm level; second, the negative correlation between the share of slaves on the farm and the share of wheat in the gross value of farm output. Table A.5 and figure A.12 in section A.1.11 of the appendix show these trends and the distribution of the share of slaves by cotton and wheat production.

Moreover, part of the literature suggests that because of their distinctive seasonality (Earle, 1978, Hanes, 1996, Wright, 2006),[19] cotton and wheat represent sharp cases of slave-intensive crop and non slave-intensive crop. Guided by these considerations, we expect a higher productivity for cotton relative to wheat to be associated to a higher use of slave labor.[20] In Appendix A.1.12.3 we expand our analysis to include sugar, tobacco and corn.

1.2.3 Westward Expansion and Slave Labor Relocation

This section introduces a model that rationalize the relationship between the Westward expansion and the relocation of slave labor. Consider the Southern US economy as a collection of N counties indexed by $i = 1, ..., N$. Each county is formed by L_i plots of land. The total number of plots in the US South is $M = \sum_{i=1}^{N} L_i$. On each plot of land a farmer uses labor as input to produce an agricultural output. Each plot in county i has relative productivity of cotton to wheat A_i.

Given the relationship between crops and slave labor presented in section 1.2.2, we assume that each farmer's evaluation of a slave is increasing in A_i.[21] Each farmer can own at most one slave. The number of slaves per county is S_i so the total number of slaves is $S = \sum_{i=1}^{N} S_i$ with $S \leq M$.

To study the effect of the Westward expansion on slave relocation, consider two periods $t = 1, 2$. At $t = 1$ the US South is formed by N_1 counties, while at $t = 2$ after the Westward expansion takes place, the US South is formed by $N_2 = N_1 + W$ counties, where W is the number of new counties formed. At $t = 1$, each county's number of slaves S_i is taken as given and determined in the previous period. At $t = 2$ after the Westward expansion takes place, there are W new counties with $M_w = \sum_{i=N_1}^{N_2} L_i$ plots. For each new plot there is a farmer demanding a slave. Because we focus on the post Atlantic Slave Trade period (after 1808), when no slaves could be imported from abroad, we assume that the number of slaves available to the economy is fixed to S.

Slaves are relocated through a market close to Rubinstein and Wolinsky (1985), in which pairs of buyers and sellers are brought together by a stochastic process. Each slave-owning agent is a seller; each non-slave-owning agent is a buyer. At the beginning of period 2 there is a matching stage in which each agent meets at most one partner. When the agents meet, they initiate a bargaining

[19] Figure A.4 in section A.1.11 shows the seasonal patterns of cotton and wheat. Figure A.4 is from Wright, 2006 who, although skeptical of a general association between cotton and slavery and wheat and free labor, recognize that their distinctive seasonality implies an advantage in the use of different sources of labor. Section A.1.11 of the Appendix develop the argument more in detail.

[20] It is important to mention that our argument is not to be considered in absolute terms, but in relative ones. We do not maintain that wheat and slavery are incompatible per se — counterexamples have been shown in the case of Piedmont Virginia by Irwin (1988) — but that, *ceteris paribus* a cotton (sugar and tobacco) producer has an advantage in the use of slave labor than a grain producer and that this has to be reflected in the allocation of slaves.

[21] See section 1.2.2 for a discussion and empirical justification of this assumption.

process over the terms of the transaction. If the agents reach an agreement, the transaction takes place, and they leave the market. Such a market mechanism is realistic because the interregional slave trade was mostly carried out in a decentralized fashion, by professional agents, through auctions or bargaining processes.

In equilibrium, for each pair, a transaction occurs if the buyer's evaluation A_j is higher than the seller's evaluation A_i, $A_j > A_i$. Because the distribution of slaves at t=1 is an equilibrium, the number of potential buyers at t=2 is equal to the number of new plots M_w.[22] Assuming that the trading pairs are randomly formed, each seller's probability to be matched with any buyer is M_w/S.[23] For a seller in county i, the probability that the matched buyer has an evaluation higher then A_i is $Pr(A_j > A_i) = \frac{\sum_{i=N_1}^{N_2} L_j I_{(A_j > A_i)}}{M_w}$, therefore the probability of a transaction for a seller in county i is

$$p_i = \frac{\sum_{i=N_1}^{N_2} L_j I_{(A_j > A_i)}}{M_w} \frac{M_w}{S}$$

Define now, for county i, the number of plots with a relative productivity higher than A_i in period t as land-rank, $LR_{it} = \sum_{j=1}^{N_t} L_j I_{(A_j > A_i)}$. The change in land-rank from period 1 to period 2 for county i is given by $\Delta LR_{it} = \sum_{i=N_1}^{N_2} L_j I_{(A_j > A_i)}$. Therefore $p_i = \frac{\Delta LR_{it}}{S}$ and the expected number of slaves sold in county i is $\frac{\Delta LR_i L_i}{S}$. Proposition 1 summarize the results and captures the essence of our empirical specification.

Proposition 1.

The expected change in the number of slaves in county i between any two periods is a decreasing function of ΔLR_{it}.

1.3 Data

Our analysis relies on information at the county level from 1790 to 1860. Following the definition of the frontier in Turner (1920) and Bazzi et al. (2017), our sample includes all counties with a population density above two individuals per square mile. To obtain a constant geographical unit over time, we harmonize all historical Census data in the NHGIS to 1860 boundaries, following the procedure suggested in Hornbeck (2010). First, we intersect all the county shapefiles from 1810 to 1850 with the 1860 shapefile. Then for each variable, we sum up all the pieces that constitute an 1860 county weighted by the share of the area the piece had in the original county. We label the data as nonreliable if most of the information of an 1860 county comes from an old county that split in more than four sub-counties. To conduct the analysis, we combine information from several sources.

[22] The distribution in period 1 is a steady state resulting from infinitely repeated random matches among the N_1 agents, therefore the agents who do not own a slave in period 1 would not conclude a transaction in period 2 and are excluded from the market.

[23] If $M_w \geq S$ the probability is 1.

Land Productivity. We construct county-level measures for crop-specific land productivity using data from the Food and Agriculture Organization's Global Agro-Ecological Zones (FAO-GAEZ) database, Fischer et al., 2002. The FAO-GAEZ database constructs indices for each crop based on information on precipitation, frequency of wet days, mean temperature, diurnal temperature range, vapor pressure, cloud cover, sunshine, ground-frost frequency, wind speed, and information on the slope of the land. The result is a suitability measure that goes from 0 to 100. We aggregate this measure of suitability for each crop at the county level, using the average as a baseline variable for crop suitability.[24] The measure we employ has been used in several studies in economics. Recent examples are Nunn and Qian (2011), which uses a suitability measure to estimates the contribution of potatoes to the world population; Bustos et al. (2016) uses the dataset to show that changes in agricultural productivity led to structural transformation in Brazil. In the context of slavery, Baiardi (2018) looks at the effect of the gender division of labor across agricultural sectors in US slavery and Acharya et al. (2016) uses cotton suitability as an instrument in the prediction of slavery's political legacy.

Census data Data are taken from the decennial US Census of Population, made available by Haines and ICPSR (2010), which includes information on white, slaves, and free black from 1790 to 1860. Data on the number of family members and slaves owned per household are from the IPUMS-USA 1790-1840, Full Count Household Level Data, are made available by Manson et al. (2018).

Production data and data on the value of the farmland are from the Census of Agriculture and Manufacture, respectively, Haines and ICPSR (2010). This information is available for 1840, 1850 and 1860.

Prices We collect Antebellum prices from several sources. Adams (1992) provides a series of wages for West Virginia. UK cotton prices are from Clark (2005), US crop prices are from Cole (1938). Finally, we obtain prices of slaves from Phillips (1905).

Geographical controls. We build geographical controls using the Census regions in Manson et al. (2018), and construct variables for counties' distance from the Mason-Dixon line. Data on the network of navigable rivers are from Atack (2017).

Presidential and gubernatorial elections. We obtain data on elections from the ICPSR (1999) which contains county-level returns for all elections to the offices of president, governor, from 1824 to 1860.

Legislators' ideology. We collect data on congressmen's ideology between 1810 and 1860 (11th to 36th Congresses) from Lewis et al. (2019). As suggested by Poole and Rosenthal (1985) and McCarty et al., 2006, we use the first dimension of the Poole-Rosenthal DW Nominate scores as a measure of politicians' ideology.[25] The scores rank members of Congress on an ideological scale using voting behavior on previous roll-calls. Because the boundaries of the Congressional Districts change

[24] All census data were obtained through the Natural Historical Geographic Information System (NHGIS) available at www.nhgis.org (see Minnesota Population Center, 2011), and the Inter-university Consortium for Political and Social Research (ICPSR) available at www.icpsr.umich.edu.

[25] For papers employing the same methodology see Autor et al., 2017 and Tabellini, 2019.

over time, we use the same technique described in the case of counties to homogenize geographic unit over time, proposed by Hornbeck (2010). We then aggregate at the Congressional District level the information available at the county level. Finally, we use the algorithm proposed by Poole and Rosenthal (1985) to decompose ideological change on different issues.

Legislators' voting behavior. We construct a new dataset on voting behavior by House of representatives when voting on issues related to slavery using roll-call votes database using the Congressional Roll-Call Votes Database Lewis et al. (2019) to study changes in pro-slavery voting behavior. We collect information on all 222 votes held on slavery in the history of the House. For each vote, we code whether a representative voted in favor or against slavery.

Secession Votes. We construct a database on the Secession Conventions' votes at the county level using several sources. In the State of Virginia, Tennessee and Texas referenda were held to ratify the Ordinance of Secession. In those cases, we collect information on the popular vote. For the rest of the States, we collect information on delegates' voting behavior or the share of popular votes obtained by the candidates to the secession conventions in each county.[26] In the case of Georgia, Arkansas and Florida, we refer to Wooster (1954, 1956, 1958); for Alabama to the original Journal of the Convention Smith (1861); for Louisiana to Dew (1970); for Mississippi to Rainwater (1938). We collected data for 9 out of 11 secessionists State. A more detailed description of the secession data is provided in Appendix A.1.10.1.

Newspapers. We obtain the text of 90,000 issues of 282 newspapers published in the Southern US during the Antebellum period. The dataset includes 2.6 billion words. We construct this database using two sources: *19th Century US Newspaper* (Gale, 2019) and *Chronicling America*, a website providing access to information about historic newspapers and select digitized newspaper pages, produced by the National Digital Newspaper Program. Using the information provided by Chronicling America, we coded for each newspaper the party affiliation in case it was reported. We manually coded the remaining newspapers.

1.4 Empirical Framework

1.4.1 Measuring Local Changes in Agricultural Incentives

The first empirical challenge we address is measuring local changes in agricultural incentives. In our baseline specification, we focus our attention on incentives for the production of the main slave intensive crop (cotton) and the main non-slave intensive crop (wheat).[27] In the Appendix, we expand the analysis by taking into account the other primary crops: sugar and tobacco, and corn.

[26] The information for the State of Texas are reported in Timmons (1973); in the case of Tennessee the data are available at the link www.arcgis.com/home/item.html?id=377f57406e51466699edf05b41bb7d77data; in the case of Virginia the data are available at the link www.newrivernotes.com/historical_antebellum_1861_virginia_voteforsecession.htm.

[27] The most prevalent crop in the Southern economy was cotton, accounting for 38% of the total value produced in the agricultural sector in 1860. Wheat accounted for 8% of the total agricultural value.

First, using the FAO-GAEZ database, we compute the county-level measures of crop productivity by taking the average of the grid-cells composing each county.[28] For each county i and crop c, we obtain a measure of crop-specific productivity, A_i^c. We use these measures of crop-specific productivity to estimate the relative productivity of each county: $RP_i \equiv \frac{A_i^{cotton}}{A_i^{wheat}}$. The measure of relative productivity is used to compute the comparative advantage of each county at a given moment in time. For any two counties $i, j \in \mathbf{N}$, county i has a comparative advantage in the production of cotton with respect to county j if $RP_i > RP_j$.

Our main measure of changes in comparative advantage is given by changes in each county position in the distribution of relative productivity from one year to the other. From year t to year $t+1$, each county decreases in ranking depending on the number of new counties with higher relative productivity.

We construct our main variable to be consistent with the measure developed in section 1.2.3. land-rank (LR_{it}) of county i at time t is given by the total amount[29] of inhabited land (Km^2), outside county i, with relative productivity higher than RP_i:

$$LR_{it} = \sum_{j=1}^{N_t} w_j I_{(RP_j > RP_i)}$$

where w_j is the size of county j and N_t is the number of counties in year t.

A county with a median land-rank in 1810 faced the competition of 297,000 Km^2 of agriculturally active land with a higher level of relative productivity. The same county by 1860 faced 1,239,000 Km^2 of land with a higher level of relative productivity. Therefore for this county, the amount of land with a higher relative productivity increase between 1810 and 1860 by 942,000 Km^2.

We expect an increase in land-rank to induce a reduction in cotton production, an increase in wheat, and a decrease in the share of slaves. As the frontier moved West, new land with higher relative productivity is added to the US South.[30] Old counties drop in the rank depending on both the relative productivity of the added counties and the relative productivity of the old ones.

Figure 3 represents the change in land-rank over time. Panel (a) represents counties below and above median land rank in 1810. Panel (b-d) includes counties with a land-rank higher than the maximum land rank in 1810. Part of the counties that were at the top of the distribution in 1810 remained at the top; others lost their position to the western counties.

[28] As a measure of productivity we use the suitability index described in section 1.3.

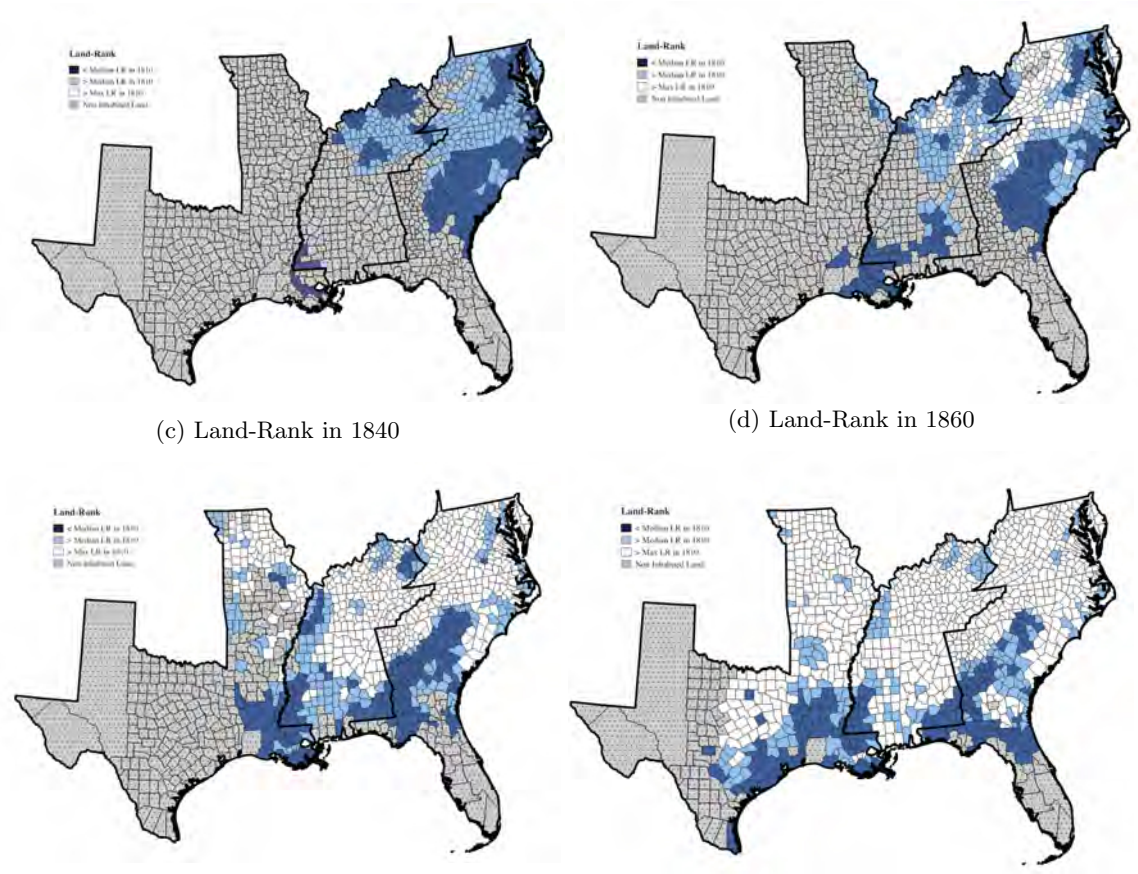
[29] We include the counties with a population density higher than 2 individuals per squared Km.

[30] Figure A.16 in Appendix A.1.16, shows the maps representing relative productivity comparing the inhabited counties in 1810 and 1860.

Figure 3: Distribution of Land-Rank over Time

(a) Land-Rank in 1810

(b) Land-Rank in 1820



(c) Land-Rank in 1840

(d) Land-Rank in 1860

The figure represents the distribution of land-rank from 1810 to 1860. Thresholds are fixed with respect to the inhabited land in 1810. Counties with a land-rank lower than the median LR in 1810 are depicted in dark blue. Counties with a land-rank larger than the maximum in 1810 are white (therefore no county in 1810 is white). Counties with a land-rank in between these two numbers are light blue. In all panels, the darkest lines represent the borders between census regions.

1.4.2 Baseline Estimating Equation

We use the variation in local agricultural incentives to estimate changes in slave labor allocation. Counties that experienced a larger increase in land-rank should reduce cotton production and increase wheat production more than counties less exposed to changes in comparative advantage. Hand-in-hand with production changes, we expect counties to adjust their use of slave labor accordingly. We test this hypothesis by estimating the following equation:

$$y_{i,t} = \alpha_i + \alpha_t + \beta LR_{i,t} + \delta X_{i,t} + \epsilon_{i,t} \quad (1)$$

where i represents county, t represents the census-year from 1810 to 1860. Our baselines outcomes of interest, $y_{i,t}$, are measures of slave labor use. Section 1.5.2 presents results for cotton and wheat production. In Section 1.6, we use the same identification strategy to study whether changes in comparative advantage had any political or ideological effects.

The term α_i controls for county fixed effects absorbing all the time-invariant county characteristics, which could potentially affect the number of slaves in a county. Differences in geographic, economic and institutional conditions that do not change over time are accounted for by these fixed effects. The term α_t accounts for census year fixed effect which captures changes over time common to all the counties: federal policy, broad cultural, economic or technological changes. α_t also captures the common effect the Westward expansion had on all counties. Therefore, with land-rank, we only capture the differential effect that the Westward expansion had on counties. Finally, we include $X_{i,t}$, a vector of variables that vary over time and space. In our baseline specification, this includes regional trends and trends that vary with the distance from the North (defined as the Mason-Dixon line). The coefficient of interest β is estimated only using differential changes in the land-rank of counties within census regions and at the same distance from the north. When $y_{i,t}$ is cotton production or the number of slaves, we expect β to be negative. The counties most affected by the competition from the new land added to the US should experience the largest change in agricultural production away from cotton and towards wheat and therefore the largest changes in the use of slave labor.

1.4.3 Identification

The variation that identifies β comes from changes over time in the counties' land-rank. First, changes in land-rank are weakly increasing for all counties. Second, the size of the change in land-rank can be very different for different counties between two census years, and even for the same county between different census years. Counties at the bottom of the distribution of relative productivity experience large changes in land-rank, while counties at the top experience small changes. For counties in the central part of the distribution, the change in land-rank depends on the distribution of relative productivity with respect to the new counties included in the US. This generates a non-linear and time-varying relationship between relative productivity and land-rank.

The critical identification assumption is that there are no unobservable characteristics that affect changes in the outcome of interests differently across places with high and low relative productivity. Furthermore, given the time-varying non-linear relationship between relative productivity and changes in land-rank, the potentially problematic unobservable characteristics should follow a similar time-varying function.

First is important to notice that given the inclusion of time fixed effects in all our regression the identification strategy is not threatened by aggregate characteristics of the Westward expansion. For

example, settlers may have decided to move in territories based on some specific soil characteristics found in the West with respect to the land already available in the US. This is not problematic for our identification strategy because our identifying variation comes from the differential effect that the addition of new territory has on the land-rank of different counties.

A more salient concern for the identification strategy is the fact that, as shown in Figure A.16, relative productivity, displays geographical clusters. These clusters may overlap with some institutional, cultural, and economic forces that affect changes in the slave population. For example, some regions in the Deep South have a high concentration of land suitable for slave labor and, at the same time, common social, demographic, political, and cultural characteristics that could affect changes in the decision to produce cotton or use slaves. If these characteristics affected the outcome of interest with a similar time-varying function as the relation between relative productivity and changes in land-rank, this would generate a bias.

We address this issue by including regional fixed effects multiplied by year fixed effects and control for distance from the North (Mason-Dixon line) multiplied by year fixed effects. The first guarantees that our results are not driven by characteristics that vary between regions. Distance from the North multiplied by year fixed effects controls instead for the potential influence states with no slaves may have on the incentives to slave-ownership. Counties at the border with the North are more exposed to Northern social and political ideas and therefore, may be more reluctant to the use of slave labor. Similarly, geographical proximity may imply stronger economic ties and influence production decisions, which would affect labor input choices. Furthermore, the closeness to the border increases the likelihood of fugitive slaves both because of the geographical proximity to the Northern free states and of the higher concentration of the "underground railroad": a network of secret routes and safe houses that facilitated the escape to freedom of slaves. Overall the increased probability of losing a slave increased the risk and cost of owning a slave. Controlling for the distance to North interacted with year fixed effect is a way to address the likely economic and cultural spillovers.

In Appendix A.1.12, we present estimates for alternative specifications to address other related concerns. In particular, we present the estimates restricting to variation coming from within states and we control for the share of the enslaved population in the pretreatment period (1810). We further decompose the shocks into crop-specific variation and propose an alternative specification using changes in prices. Finally, we show that our estimation is robust to restricting our analysis to the sample of those counties belonging to the US in 1810 and restricting our analysis to the counties formed during the Westward expansion. In our baseline specification, our identifying variation compares the rate of change of the enslaved population in two counties net of regional trend and trend varying with the distance to the Northern border, both exposed to the same change in the quality and quantity of available agricultural land.

1.5 Agricultural Incentives and Slave Labor Allocation

1.5.1 Main Results on Slave Allocation

Table 1 shows our main results on slave labor relocation. The results are consistent with our proposed mechanism. Counties that experienced a greater loss in the comparative advantage of cotton vs. wheat went through a greater decrease in the slave labor employed. All the coefficients show the effect of an increase in land-rank on the presence of slaves at the county level. $LR_{i,t}$ is standardized so that the county with the median RP_i in 1810 experienced an increase in $LR_{i,t}$ of 1 by 1860. Column (1) in table 1 shows that the share of the enslaved population in a county with a median RP in 1810 dropped by 10.8 p.p. between 1810 and 1860 due to the Westward expansion.

Table 1: Slave Relocation - Baseline

	(1)	(2)	(3)
	% Slaves	Slaves per 1000 km^2	N. Slaves
Land-Rank$_{i,t}$	-0.108***	-1864.7***	-2587.3***
	(0.0134)	(225.1)	(338.8)
Observations	4471	4471	4471
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes

Note: This table shows the effect of changes in the land-rank on slaves' relocation between 1810 and 1860. The variable of interest is Land-Rank$_{it} = \sum_{j=1}^{N_t} w_j I_{(RP_j \geq RP_i)}$ with $RP_i = \frac{A_i^{cotton}}{A_i^{wheat}}$. The measure Land-Rank$_{i,t}$ is standardized so that the county with the a median RP in 1810 gained 1 Land-Rank$_{i,t}$ between 1810 and 1860. The coefficient in column (1) reports the effect on the share of slaves with respect to the total population. Column (2) reports the effect on the number of slaves per 1000 Km^2 and column (3) for the absolute number of slaves. Each regression includes county and year fixed effect, and trends in the distance from the North and census regional trends. Robust Standard Errors clustered at the county level are shown in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The reduction in the percentage of the enslaved population is substantial when compared to an average share of slaves of 28 % in 1810. Overall, the estimates imply that between 1810 and 1860, almost 800,000 slaves (20% of the slaves) were relocated due to the competitive forces generated by the Westward expansion.[31]

Columns (2) and (3) show that the estimates are robust to different measures of slave labor at the county level. In column (2) the outcome of interest is the amount of slaves per 1,000Km^2 of land. Estimates show that a county with the median RP in 1810 lost 1,865 slaves per 1,000Km^2 between 1810 and 1860 due to the Westward expansion. Column (3) shows that a county with the median RP in 1810 lost 2,587 slaves between 1810 and 1860 due to the Westward expansion. Again, the size of the coefficient has to be compared to an average number of slaves in 1810 of 2'517.

[31] The number of slaves that each county relocated because of the Westward expansion is computed multiplying the estimated parameter in column (1) of Table 1 by the total amount of land-rank lost and the total population of the county. The total relocation is then estimated by summing up this value over all counties.

In Appendix A.1.12, we propose several alternative specifications to show the robustness of our results. First, in Appendix A.1.12.1, we estimate the effect of changes in comparative advantage using the interaction between national prices (cotton vs. wheat and slave vs. free labor) and local measures of RP. Second, Appendix A.1.12.2 shows that our estimation is robust to the restriction of the sample both to those counties belonging to the US in 1810 and to the counties formed during the westward expansion. In Appendix A.1.12.3, we reproduce the baseline results taking into account sugar and tobacco productivity. In Appendix A.1.12.4, we decompose our variation into crop-specific changes of land-rank. The exercise shows that the timing of the slave relocation follows different patterns depending on the timing of the expansion into cotton or tobacco productive land. In Appendix A.1.12.5 we replicate the baseline regression exploiting only within-state variation. In Appendix A.1.12.6, we study the role of alternative mechanisms that could account for the observed relocation process. In particular, we control for the proximity to a navigable river and changes in the value of the farm.[32] Finally, in Appendix A.1.12.7, we show that the results are robust to including the interaction between share of slaves in 1800 and year fixed effect, log transformation of the main variable of interest, linear trends and to de-trended outcome variable with respect to the change between 1790 and 1800.

1.5.2 Mechanism: Agricultural Transformation

This section shows that the effect of the Westward expansion on slave relocation is associated to adjustments in the crop mix. Table 2 reports the results of our baseline specification, where the outcomes of interest are measures of cotton and wheat production: both physical output and value. Because of data limitation,[33] we perform the analysis only for the years 1840 - 1860.

As expected, counties that lost comparative advantage in the production of cotton with respect to wheat reduced the production of cotton and increased the production of wheat. A county that in 1840 had a median relative productivity of cotton with respect to wheat lost around 300,000 Km^2 in land-rank between 1840 and 1860. This county experienced, between 1840 and 1860, a 66% reduction in the production of cotton and a 46% increase in the production of wheat. This corresponds to a 58% drop in the value of cotton production and a 48% increase in the value of wheat production.The interpretation of the coefficient is obtained using the following transformation. The coefficient associated to the loss in land-rank between 1840 and 1860 is $\hat{\beta} \times .3$, therefore the percentage change in cotton production can be obtained as $e^{-3.633 \times .3} - 1 = -.66$, which implies a decrease of 66% in cotton production.

In Appendix A.1.12.6 we explore alternative mechanisms mentioned in the literature. We show that the estimates of the change in comparative advantage are robust to the inclusion of changes in the availability of means of transportation (proximity to navigable rivers)[34] and to the value of the farm.

1.6 Political and Ideological Effects of Economic Incentives

In this section, we explore the political and ideological consequences of changes in economic incentives in the use of slave labor. First, in section 1.6.2, we analyze the immediate political implication this economic transformation had

[32] The first one proposed by Fogel (1989), the second by Wright in several instances, see Wright (2003) for a recent discussion.

[33] The US census started to collect information on agricultural output from 1840.

[34] We do not study the railroad expansion because of its reduced presence in the South up to the 50s.

Table 2: Mechanism - Agricultural Transformation

	ln(Production)		ln(Value)	
	(1)	(2)	(3)	(4)
	Cotton	Wheat	Cotton	Wheat
Land-Rank$_{i,t}$	-3.633***	1.276***	-2.858***	1.308***
	(1.082)	(0.396)	(0.888)	(0.409)
Observations	2790	2785	2790	2785
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes
Sample	1840-1860	1840-1860	1840-1860	1840-1860

Note: This table shows the effect of changes in the distribution of relative productivity on agricultural production between 1840 and 1860. The variable of interest is $LR_{it} = \sum_{j=1}^{N_t} w_j I_{(RP_j \geq RP_i)}$ which captures the number of (1'000,000) Km^2 of land with higher relative productivity with respect to county i in year t. The coefficients in columns (1) and (2) report the effect on the log of production of cotton and wheat, respectively. Columns (3) and (4) report the effect on the value produced in cotton and wheat and column (5) and (6) on cotton and wheat as a share of the total agricultural value produced in the county. Each regression includes county and year fixed effect, trends in distance from the North, and Region trends. Errors clustered at the county level are shown in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

on the politics of slavery. We analyze two aspects: first, we look at members of Congress' voting behavior on issues concerning slavery; second, we look at voting behavior in the secession conventions, linking local economic conditions to pro-secession political preferences. Second, in section 1.6.5, we extend our analysis to political parties competition and changes in the ideological position of legislators on issues different from slavery.

1.6.1 Historical Background: The Politics of Slavery

The period studied saw the consolidation of a bipartisan political system and the sectional (North-South) conflict over slavery. In the early years after the British-American War (1812), the Federalist and the Republican-Democrat came to dominate the political scene. During the First Party System (1792 - 1824), partisanship was minimal, and parties' role in shaping mass participation into politics was very reduced. Up until the Missouri crisis[35], the issue of slavery was relatively little debated in Congress. The crisis played a central role in shaping the sectional conflict and in focusing the national attention on slavery. The House Speaker, Henry Clay, remembered the crisis as an event which "monopolized all our conversation, all our thoughts and ... all our time. Nobody seemed to think or care about anything else."[36] The crises ended up with the Missouri compromise (1820), establishing the Mason-Dixon line as the demarcation of slave and free territories. From the end of the 1820s congressional debates on slavery grew in importance, leading to controversies both around sectional lines (North vs. South) and party lines.[37] Figure A.11 in Appendix A.1.13.1 shows the timing of the congressional debate over slavery as the number of laws concerning slavery voted by Congress.

[35] A congressional crisis centered around the acceptance of Missouri as a slave state.

[36] See Mason, 2006, p. 177

[37] Due to the explicit effort to organize national politics on lines other than slavery. Martin Van Buren, the principal architect of the Second Party System, wrote that "if the old" party loyalties that bound "the planters of the South and the plain Republicans of the North" receded, "geographical divisions founded on local interests or, what is worse[,] prejudices between free and slaveholding states will inevitably take their place." (Mason, 2006, p. 214)

The First Party System gave way to the Second Party System (1828 - 1860) which saw the rise of the Jacksonian and Anti-Jacksonian factions within the Republican-Democratic party and ultimately their transformation into Democratic and Whig parties. The two parties came to dominate Federal and State politics up until the eve of the Civil War. Despite their apparent equal commitment to slavery,[38] we show that during the Second Party System, parties did differ substantially in their share of votes in favor of slavery even in the South.

We establish this fact analyzing the differences in the roll-call voting behavior of Southern Congressmen over the issue of slavery, in 3 distinct periods. First, between 1818 (first vote on slavery since 1810) and 1828. In this period, 14 votes regarding slavery were held, when the two main parties representing Southern voters were the Federalist and the Republican-Democrat party. Second, during the Jacksonian era between 1828 and 1838 were Congress held 34 votes regarding slavery. Finally, from 1838 to the eve of the Civil War, 187 votes regarding slavery were held. During this period, the two main parties representing Southern voters were the Whigs and the Democrats. Each vote is coded as in favor or against slavery, Appendix A.1.10.2 explains the coding procedure. The issues at stake were mainly related to the expansion of slavery in the territories and the debate on fugitive laws.

Table 3: Party Difference in Votes Regarding Slavery

	Federalist vs. Rep-Dem 1818 - 1828		Anti-Jackson Vs. Jacksonian 1828 - 1838		Whig Vs. Democrat 1838 - 1860	
	All Votes	Drop Abstain	All Votes	Drop Abstain	All Votes	Drop Abstain
Difference	-0.0211	-0.0183	-0.1046***	-0.1378***	-0.0951***	-0.0915***
	(0.0301)	(0.0324)	(0.0150)	(0.0178)	(0.0053)	(0.0056)
Observations	1009	835	2915	2280	15851	12515
Number of Laws	14	14	34	34	187	187

Note: This table reports the difference in the probability of voting against laws supporting slavery between the two main parties for the three periods. The main variable takes value 1 if a vote in favor of slavery is cast, value 0 if against slavery, value .5 in case of abstention. The sample includes all roll-call votes on slavery from 1818 (when the first vote on slavery was held) to 1860, in Congress. The table reports estimates only for congressmen elected in Southern congressional districts. Robust standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3 shows the difference in the party fixed effect for the two main parties for each of the three periods. Two results emerge from the analysis. First, southern parties had some differences in their view of slavery, at least to the extent that this is reflected in their voting behavior. Second, slavery became a partisan issue only after 1828. Since then, the (Southern) Jacksonian party and the (Southern) Democratic party systematically voted more in favor of slavery with respect to other southern members of Congress. The difference in the likelihood of voting in support of slavery is around 10 percentage points. This difference is substantial given that, in this period, Southern members of Congress from the Jacksonian and Democrats, on average, voted only 6.2% of the time against slavery. Although these differences are large, it is important to highlight that none of the Southern parties ever campaigned for the abolition of slavery. The estimates in Table 3 reflect differences in the willingness to compromise on the defense of slavery.[39] Because the Whig party embraced state intervention as a tool for economic development, the southern section seemed willing to compromise on slavery to push for the adoption of these measures.[40]

[38] The Consensus historians have long maintained that slavery was the cornerstone of southern politics, independently on party politics. See for example Cooper (1978). Other works have highlighted the geographical division of the system, Crofts (1989). Other analysis have focused on divisions between yeoman, poor whites, and slaveowners, Watson (1985); Bolton (1994); Merritt (2017)

[39] Although marginal during the last decades of the Antebellum period, an antislavery movement existed in the South. See for discussions Stampp (1943); Finnie (1969)

[40] For example, the ad valorem tax on slavery became the main point of contention in the North Carolina gubernatorial race of 1860 that saw the democratic candidate, John Ellis, opposing the ad valorem taxation while the Whig

With time, divisions over the expansion of slavery in the territories became more salient, and, in 1854, the Whig Party broke down, opening the space to the rise of the Republican Party in the North. The 1860 election saw the Republican presidential nominee, Abraham Lincoln, winning the election with the support of only the Northern states. The victory led to the last sectional crisis before the Civil War. During the weeks after the elections, several southern states called for representatives conventions to discuss the opportunity of seceding from the Union. Between December 1860 and February 1861, South Carolina, Mississippi, Florida, Alabama, Georgia, Louisiana, and Texas seceded from the Union. At stake, it was the defense of the Southern property and the "right" to maintain the institution of slavery. Mr. Morgan, delegate of the Alabama Convention, clearly made this point on January 25th, 1861: "The Ordinance of Secession rests, in a great measure, upon our assertion of a right to enslave the African race, or, what amounts to the same thing, to hold them in slavery."[41] The document issued by the Georgia convention is also an eloquent testimony that secession was indeed intended to defend the institution of slavery: "The people of Georgia [...] refuse to commit their own to the rulers whom the North offers us. Why? Because by their declared principles and policy they have outlawed $3,000,000,000 of our property [...]."[42] After the Battle of Fort Sumter, a battle commonly regarded as the starting point of the Civil War, the Confederates were joined by the secession of Virginia, Arkansas, Tennessee, and North Carolina.

1.6.2 Political Support for Slavery

1.6.3 Legislators' Roll-call Behavior on Laws Regarding Slavery

In this section, we study the effects of changes in local agricultural incentives on the roll-call behavior of congressmen when voting on the issue of slavery. Because changes in incentives to the use of slave labor quite naturally affect the return from actions devoted to the defense of slavery, in a context of growing hostility to the institution, political commitment to its defense represented a costly behavior. As previously described, we focus on the 222 times Congress voted on the issue of slavery. The main outcome of interest is equal to 1 if the representative voted in favor of slavery and 0 if against. In columns (1) and (3) abstentions are dropped while in columns (2) and (4) are coded as 0.5. As in the other sections, our main variable of interest is land-rank (this time computed at the congressional district level).

Results in Table 4 show that members of Congress elected in districts that lost comparative advantage in the use of slave labor are less likely to vote in favor of slavery. To interpret the magnitude of these results, notice that at the time of the first vote in Congress regarding slavery (15th Congress 1817-1819), the median congressional district competed with 430,000 Km^2 of land with a higher level of relative productivity. The same county, by the time of the last vote regarding slavery (36th Congress 1859-1861), was facing 1,280,000 Km^2 of land with a higher level of relative productivity. This implies an increase of 850,000 Km^2 between 1818 and 1860. We normalize land-rank to have a unit change between the 15th and the 36th Congress. Our results show that due to the loss in comparative advantage, representatives elected in a congressional district with median land-rank increased the probability of voting against slavery by 11 to 15 percentage points. Given that the Southern share of votes against slavery was 19%, the probability of voting against slavery for representatives of a district exposed to such a change in economic incentives almost doubled. This change is larger than the largest difference in voting behavior on the issue of slavery across party lines during the whole period in the analysis (see table 3). Column (3) and (4) of table 4, exploiting only within party variation, show that these changes are almost entirely independent of the Congressman's party affiliation.

1.6.4 Secession Conventions

To further understand the relationship between agricultural comparative advantage and political preferences in favor of slavery, we study voting behavior in the secession conventions. As described in Section 1.6.1, we interpret a vote

candidate, John Pool, supported the tax (Bolton, 1994, p. 135). Or during the 29th Congress, 99% of the Whigs voted for high tariffs, while 83% of the Democrats voted for low or moderate tariffs. An economic policy — Calhoun and other Southern politicians argued — that was actually a tax on cotton producers (Fogel, 1989, pp. 320, 296).

[41] See Smith, 1861 p. 196

[42] From the Declaration of Causes of the Georgia Secession Convention, 1861. See Smith, 1861

Table 4: Votes on Laws Regarding Slavery - Pro-slavery Vote

	Pro Slavery Votes			
	(1)	(2)	(3)	(4)
Land-Rank$_{it}$	-0.111***	-0.148***	-0.107***	-0.143***
	(0.0346)	(0.0495)	(0.0333)	(0.0485)
Observations	15170	14910	15148	14891
Cong. District FE	Yes	Yes	Yes	Yes
Vote FE	Yes	Yes	Yes	Yes
Region * Vote FE	Yes	Yes	Yes	Yes
ln(Distance North) * Vote FE	Yes	Yes	Yes	Yes
Party * Vote FE	No	No	Yes	Yes
Drop Abstain	No	Yes	No	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table shows the effect of Land-Rank$_{it}$ on representatives' propensity to vote in favor of slavery in the House. The main outcome of interest is equal to 1 if the representative voted in favor of slavery and 0 if against. In columns (1) and (3), abstentions are coded as 0.5. In columns (2) and (4), abstentions are dropped. All regressions include county and vote fixed effect, regional FE * Vote FE and ln(Distance to the North) * Vote FE. Errors clustered at the Region * Vote level are shown in parenthesis.

in favor of secession as a vote in defense of slavery.

Ordinances of secession were voted by committees of delegates elected for that specific purpose and reunited in caucuses known as Secession Conventions. In a few cases, the ordinance of secession had to be ratified by popular vote. Appendix A.1.10.1 provides a description of the coding of the outcome variable for each state. Although our measure of pro-secession votes is not uniform across states, our estimates are all computed from within-state variation. This eliminates the concerns related to differential measurement error between states. The main caveat of this exercise is given by the cross-sectional nature of the votes in the Secession Conventions. This implies that we observe voting behavior only at one point in time. Keeping this caveat in mind, focusing on the year 1860 allows us to fully exploit the information contained in the 1860 Census — the richest of the census year we can rely on.

Table 5 show several specifications including a large number of covariates. Our baseline specification — column (1) — includes state fixed-effect and distance from the Northern border. Our independent variable is RP_i. The variable represents the relative productivity of cotton with respect to wheat. We expect the share of votes in favor of secession to be increasing in RP_i. RP_i is standardized to have standard deviation of 1. A one standard deviation higher level of comparative advantage in the production with slave labor (RP_i) increases the votes share for secession from 10 to 11 pp. depending on the specification. This result is particularly striking given that in several secession votes — all but the ones in Virginia, Texas, Tennessee, and Georgia — the secession was decided by less than 10 percentage points. Furthermore, the stability of the coefficient and its magnitude seem to confirm the hypothesis that agricultural comparative advantage in slave intensive crops was at the basis of the political support for the institution of slavery.

1.6.5 Party Politics and Ideological Change

1.6.6 Presidential and Gubernatorial Election

In this section, we move beyond the direct implication economic incentives had on pro-slavery (pro-secession) voting behavior and explore the deeper consequences that this underlying economic transformation had on southern political

Table 5: Secession Conventions

	% Votes for Secession			
	(1)	(2)	(3)	(4)
RP_i	0.111***	0.103***	0.104***	0.111***
	(0.0153)	(0.0162)	(0.0180)	(0.0186)
Observations	660	653	516	509
State FE	Yes	Yes	Yes	Yes
ln(Distance North)	Yes	Yes	Yes	Yes
Agricultural Controls	No	Yes	Yes	Yes
Manufacturing Controls	No	No	Yes	Yes
Religion Controls	No	No	No	Yes

Note: The table shows that counties with a higher standard deviation in relative productivity, RP_i, voted on average about 10.5 pp more in favor of secession. The sample mean is 67%. All specifications include state fixed effect and distance from the Northern border. The first specification does not include additional controls. Column (2) introduces information on the value of the farm, the value of the livestock, the value of the farm equipment, the share of improved acres. Column (3) also includes the value of home manufactured production, the value of total manufacture production, the value of the raw material used in manufacture production, the value of capital in the manufacturing sector, the number of manufacture establishment, the share of individuals, both males and females employed in manufacturing. Finally, column (4) includes the number of churches per capita and the share of Baptist and Methodist churches. Standard errors in parenthesis *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

competition. In table 6, we study how changes in agricultural comparative advantage determined voting patterns in presidential and gubernatorial elections. Given the differences in voting behavior described in section 1.6.1, we study the share of votes received by the Jacksonian and Democratic parties at the county level (ICPSR, 1999) between 1828 and 1860. Our sample includes 9 presidential elections.[43] The frequency of gubernatorial election varies by state (2 or 4 years). Additionally, some governors did not complete their mandate; therefore, elections may happen in off-years.

The results show that, both in the case of the presidential elections and gubernatorial elections, counties that lost comparative advantage in the use of slave labor decreased their vote share for the Jacksonian\Democratic party. A median county in 1828 had a land-rank of 530,000 Km^2. Because of the Westward expansion, by the time of the 1860 presidential election, the same county shifted to a land-rank of 1,210,000 Km^2. Land-Rank$_{i,t}$ of the median county is normalized to a one-unit change between 1828 and 1860. The estimates in Table 6 imply that the vote share for the Democrats (Jacksonian) for this county dropped by 12 percentage points between 1828 and 1860 because of the comparative advantage lost in the use of slave labor. These effects are large given that the average vote share for the Jacksonian\Democratic party was 54%.

1.6.7 Legislators' Voting Behavior

In this section, we investigate whether changes in agricultural comparative advantage of cotton with respect to wheat translated in changes in the ideological position of Congressmen. To summarize ideology, we use the DW-Nominate score (Poole and Rosenthal (1985)), a score constructed based on roll-call voting behavior of congressmen. As Autor et al. (2017) and Tabellini (2019), we use the first dimension of the DW-Nominate score.

We use three different ways to measures the nominate score: the first, "Nominate" measures the ideology of each legislator for every Congress. The second, "Nominate - NP" is computed using the whole roll-call career of a legislator. Finally, "Position", that represents the ranking of each legislator within their congressional year in the distribution

[43] Hold every 4 years.

Table 6: Electoral Results

	Presidential Election	Gubernatorial Election
	% Jacksonian or Democratic	% Jacksonian or Democratic
Land-Rank$_{it}$	-0.120***	-0.114***
	(0.0394)	(0.0397)
Observations	5960	6344
County FE	Yes	Yes
Year FE	Yes	Yes
Region * Year	Yes	Yes
ln(Distance North) * Year	Yes	Yes

Note: The table shows the effect of changes in Land-Rank$_{it}$ on the share of votes received by the Jacksonian - Democratic party. The variable Jacksonian - Democratic is the share of the Jacksonian party up to 1836 and the Democratic party afterwards. All regressions include county and year fixed effect, trends that vary with distance from the North and regional trends. Errors clustered at the region *year level are shown in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

of ideology of all Southern members of Congress. All measures are in a scale between 0 and 100. The higher the ideological score of a given member of Congress, the closer is his voting behavior to the Jacksonian\Democratic party. Table A.22 in Appendix A.1.13.2 shows the ideological position of the antebellum political parties. The geographical unit is the congressional district.[44] Overall we study changes in ideology analyzing 26 Congresses from the 11th (1809-1811) to the 36th (1859-1861).

Results in Table 7 show that when a congressional district loses comparative advantage in the use of slave labor, the congressman elected in this congressional district votes less often in accordance with the Jacksonian\Democratic party on all policy areas voted in Congress. This result holds for all measures of ideology. After a loss in comparative advantage in the use of slave labor: members of Congress closer to the Jacksonian\Democratic party are less likely to be elected (Column(1)). Once elected, Congressmen tend to vote less in accordance with the Jacksonian\Democratic party (Column (2)). With respect to other Southern members of Congress in that same Congress, they vote less in accordance with the Jacksonian\Democratic party (Column (3)). In appendix A.1.13.2, table A.23 shows that the results are unchanged if we compute a nominate score excluding all the votes held on slavery.

Also in this case, land-rank has been normalized so that a median congressional district increase land-rank by 1 unit between the 11th Congress (1809-1811) and the 36th Congress (1859-1861). Because of this normalization, estimates imply that due to the loss in comparative advantage in the use of slave labor, the ideology index of this congressional district increased by 12 points between the 11th and the 36th Congress. This effect is particularly large given that the average ideological distance between Jacksonian\Democratic party and the Anti-Jacksonian \Whig party is of 23 points. This same congressional district saw the ideological position of its representative compared to the distribution of the other southern Congressmen in the same Congress shift markedly towards Anti-Jacksonian \Whig position. Overall, between the 11th and the 36th Congress, the representative of this congressional district shifted by 26 positions.

In Columns from (4) to (6), we show that the results still hold even after controlling for Party * Year fixed effects. Therefore these results are not only driven by changes in the party affiliation of congressmen representing a certain congressional district.

[44] In appendix A.1.13.2 we also examine the roll-call behavior of senators. In the period studied, senators were not elected by voters but instead appointed by each state legislature. Because of this, we expect them to be less responsive to the preferences of their constituencies. Additionally, there is less variation to be exploited as the geographical unit of interest is the state. Furthermore, senators are reappointed only every 6 years.

Table 7: Legislator's Ideology

	Nominate - NP	Nominate	Position	Nominate - NP	Nominate	Position
	(1)	(2)	(3)	(4)	(5)	(6)
Land-Rank$_{it}$	-11.91***	-12.04***	-25.87***	-10.52***	-9.744***	-21.86***
	(3.433)	(3.939)	(8.419)	(1.700)	(2.944)	(6.458)
Observations	1575	1575	1575	1570	1570	1570
Cong. District FE	Yes	Yes	Yes	Yes	Yes	Yes
Congress Num. FE	Yes	Yes	Yes	Yes	Yes	Yes
Region * Cong.	Yes	Yes	Yes	Yes	Yes	Yes
ln(Distance North) * Cong.	Yes	Yes	Yes	Yes	Yes	Yes
Party * Cong.	No	No	No	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table shows the effect of Land-Rank$_{it}$ on three different measures of Ideology for the House of Representatives. Nominate, measures the ideology of each legislator for every congress (every 2 years). Nominate - NP, measures the ideology of each legislator based on the whole roll-call career of a legislator. Position, for each congress measures the rank of each legislator in the distribution of ideologies. For all measures, higher scores imply a more conservative ideology. All measures are measured between 0 and 100. All regressions include county and year fixed effect, regional trends and trends varying with distance from the North. Errors clustered at the region *year level are shown in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

1.7 Public Discourse and Free Blacks

These systematic changes in voting behavior, of both politicians and citizens, indicate an ongoing pattern of political transformation. To what extent this political transformation reflected changes in social norms and attitudes toward slavery it is hard to assess. To shed further light on the link between economic incentives to slave-ownership and the transformation of the political environment, we investigate two interrelated aspects of the social context. First, we look at changes in the public debate held on slavery by the media. Because newspapers reflect the equilibrium slant of local communities, they provide useful information on potential ideological shifts on the issue of slavery. Second, we analyze changes in the free black population. Free blacks were regarded as a threat to the institution of slavery, and as such, their presence was considered with hostility by most of the advocates of slavery. Changes in the free black population as a consequence of changes in economic incentives to slave-ownership might indicate changes in the attitudes towards the free black population.

1.7.1 Newspapers' Supply of Slave-related Content

To better understand the effects of a change in agricultural incentives on the ideological environment, we study the content of historical local newspapers. The study of newspapers is particularly relevant given that during the first half of the 19th-century, newspapers had a crucial importance for the public debate as the press was the only source of political information. Even though circulation records are not available before 1870, scholars (see references in Pasley, 2002 p. 415) suggests that newspapers diffusion was extensive. Two main characteristics of the press are worth noticing: newspapers were highly local and highly partisan (Song, 2016). Although we do not have complete information about antebellum newspapers' partisanship, a good approximation can be given by its figure in 1870, when as little as 11% of the newspapers declared themselves independent (Gentzkow et al., 2006).

Newspapers and their editors were significant players in the political process, linking parties, voters, and providing the arguments that shaped popular views. As noticed by Pasley (2002), "newspapers conducted many if not most of the opinion-shaping activities we now call campaigning: communicating a party's message, promoting its candidates, attacking their opponents, and encouraging voters to turn out at the polls." [...] "Party newspapers contributed in fundamental ways to the very existence of the parties and the creation of a sense of membership, identity, and

common cause among political activists and voters."[45] In a context where the reach of the conventional party system was limited, local newspapers represented the main actors in popular politics. As such, local newspapers represent a rich source of information concerning local ideological views.

To study changes in the supply of content related to slavery, we build a model based on Gentzkow and Shapiro, 2010. Two are the key ingredients of the model: first, because readers have preferences for like-minded newspapers, outlets minimize the distance between their ideological slant and the preferences of their potential readers. Second, newspapers can be either partisan or not. A partisan newspaper cannot change political position on a given topic but can strategically modify its level of supply to move toward reader's preferences.

Under these conditions, a partisan newspaper located in an area were citizens become less pro-slavery reacts by modifying the supply of content related to slavery. The model predicts that a newspaper affiliated to a pro-slavery party to reduce their supply of slavery-related content as its position on the topic become less aligned with the preferences of potential readers. Partisan newspapers affiliated to political parties more critical towards slavery should instead increase their supply of content related to slavery. Non-affiliated newspapers do not need to modify the supply of slavery-related content. The logic behind these results is formalized in Appendix A.1.14.7.

To test the prediction of the model, we build a new database of 282 newspapers operating in our period of interest in the US South. Following the information in Chronicling America,[46] we code 79 pro-slavery newspapers. These include newspapers supporting the Jacksonian or Democratic party, Fire-Eaters, State-Rights or Confederate newspapers. Sixty newspapers are instead partisan but not linked to any of these political groups. These mainly include the Whig or Know-Nothing party. This group also includes a few abolitionist newspapers. All other newspapers are coded as non-partisan. On average, we observe a newspaper for 13 years and 55 issues per year for each newspaper. Newspapers may vary greatly in the frequency of their issues. The most common formats during this period are weekly and daily newspapers. In total, our sample comprises almost 90,000 issues that contain 2.6 billion words. To construct our baseline measure of supply of slave-related content, we first compute the number of times each issue mentions some slavery-related words. Then for each newspaper and year we calculate the average. We separate these words in the 2 topics related to the debate over slavery: abolition and the fugitive laws. We capture the debate on abolition, looking at the frequency of the words "abolit*" and "emancipat*".[47] We capture the intensity of the debate on fugitive laws counting the words "fugitive*" and "runaway*". Finally, we capture the general discussion about slavery by counting the number of times "slave*" is mentioned. On average, an issue uses 10 slavery-related words.

Using these measures, we study changes in newspapers' behavior, estimating the following equation.

[45] See Pasley, 2002 p. 4 and p. 11.

[46] When Chronicling America reported no information for the newspaper affiliation, we relayed on individual web searches. Section A.1.14.1 in Appendix reports few examples of the information on partisanship.

[47] The * symbol represents a wildcard character.

$$y_{ct} = \alpha_c + \gamma_t + \beta_1 LR_{ct} + \beta_2 LR_{ct} \mathbb{1}\{\text{Pro-Slavery}\}_c + \beta_3 LR_{ct} \mathbb{1}\{\text{Other Affiliation}\}_c + \delta X_{ct} + \epsilon_{ct} \quad (2)$$

Newspapers' circulation was limited to circulation areas within a certain distance from the printing site. Because we do not have information about Antebellum circulation, we approximate this measure taking an area of 20Km radius from the printing city.[48] For each newspaper, we determine its circulation area and compute statistics for soil characteristics at the circulation area level. Equation 2 estimates changes over time t in the supply of slave-related content by a given newspaper operating in circulation area c. The independent variable LR_{ct} is the land-rank at time t based on the relative suitability of cotton with respect to wheat of circulation area c.

Table 8: Newspapers

	All Slavery Related Words	Abolition Emancipation	Fugitive Runaway	Slave Slavery
Pro-slavery $\hat{\beta}_1 + \hat{\beta}_2$	-0.920***	-1.223***	-0.790***	-0.483**
	(0.286)	(0.311)	(0.231)	(0.234)
Other Affiliation $\hat{\beta}_1 + \hat{\beta}_3$	1.465***	1.564***	1.028***	1.444***
	(0.328)	(0.302)	(0.303)	(0.319)
Observations	1505	1505	1505	1505
Year FE	Yes	Yes	Yes	Yes
Newspaper FE	Yes	Yes	Yes	Yes
Affiliation * Year	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes

Note: This table shows the marginal effect of land-rank in a 20Km radius on the supply of slavery related content. For each column the first estimated parameter shows the effects for pro-slavery newspapers. The second estimated parameters shows the effect on the other partisan newspapers. All estimates are based on the estimation of equation (2). The estimates associated to pro-slavery is the sum of $\hat{\beta}_1$ and $\hat{\beta}_2$, while the estimate associated to "other affiliation" is the sum of $\hat{\beta}_1$ and $\hat{\beta}_3$. The dependent variable is the inverse hyperbolic sine transformation of the average number of times an issue mentions slave-related words. All regression control for Newspaper fixed effects, $\mathbb{1}\{\text{Pro-Slavery}\}*$ Year FE, $\mathbb{1}\{\text{Other Affiliation}\}*$ Year FE, Distance to the North $*$ Year FE and Census Region $*$ Year FE. Standard errors are clustered at the newspaper level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8 shows that changes in the comparative advantage in the use of slave labor had a substantial effect on the supply of content related to slavery. In line with our theoretical expectations, pro-slavery newspapers located in places that lost comparative advantage in the use of slave labor decreased the supply of content related to slavery. The other partisan newspapers instead increased the supply of this type of content. In order to interpret the magnitudes of the estimate notice that LR_{ct} is normalized so that a newspaper with a median land-rank in 1810 would have experienced, between 1810 and 1860, an increase of LR_{ct} of 1. On average, a pro-slavery newspaper that in 1810 had a median land-rank decreased by 60% the use of slavery-related words between 1810 and 1860 due to the loss of comparative advantage in the use of slave labor. A partisan newspaper located in the same area that instead was not affiliated with a pro-slavery party increased the use of slavery-related words by three times between 1810 and 1860. In Appendix A.1.14.4, we show that we do not observe a similar pattern of supply of newspaper content for some common non-slavery related words (Work, Tax, Price, Bible, Dollar). Table A.1.14.6 shows the most frequent bigrams when we restrict the sample to issues mentioning abolition and slavery. This section shows that changes in economic conditions changed the debate over slavery, differently for newspapers representing different political positions, suggesting changes in the underlying perception of slavery at the local level.

[48] In Appendix A.1.14.2 we show the location of all newspapers by affiliation. In Appendix A.1.14.3 we replicate our results using a 50Km radius as a circulation area.

1.7.2 Free Black Population

> [...] A free negro is an anomaly — a violation of the unerring laws of nature — a stigma upon the wise and benevolent system of Southern labor - a contradiction of the Bible. The status of slavery is the only one for which the African is adapted; and a great wrong is done him when he is removed to a higher and more responsible sphere.
> *Jackson, Semi-Weekly Mississippian, 21 May 1858*

We conclude this section with the analysis of the free black population. Free blacks were a small minority in the Antebellum South who accounted for 6 - 10% of the black population. Their particular status made them the object of rancor and hate. Because the ideology on which slavery was based and justified increasingly relied on racial arguments for the division between free and bond people, free back were perceived as a threat to the institution of slavery. A free black was considered a perverted element of the society as it represented a violation of its natural order. For this reason, differences in the number of free blacks could be an indicator of differences in local social norms and racial attitudes. In this section, we show that changes in the local advantage in the use of slave labor also affected the dynamics of the free blacks population.

Table 9 shows that counties that lost comparative advantage in the use of slave labor experienced an increase in the size of the free black population. We interpret this as an indication of a softening of the local social norms regarding the hierarchy of races. The county with the median land-rank in 1810 experienced an increase in the share of the free blacks of 1.6 percentage points. This represents almost a 30% increase in the free black population.

Table 9: Free Black Population

	% Free on Black	% Free on Total	ln(Free)
Land-Rank$_{it}$	0.0163***	0.00386***	0.283**
	(0.00604)	(0.00144)	(0.116)
Observations	4470	4471	4471
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes

Note: This table shows the effect of changes in the land-rank on the free black population between 1810 and 1860. The variable of interest is $LandRank_{it} = \sum_{j=1}^{N_t} w_j I_{(RP_j \geq RP_i)}$ calculated in million Km^2 of land and $RP_i = \frac{A_i^{cotton}}{A_i^{wheat}}$. The county with the median RP in 1810 gained 0.942 land-rank between 1810 and 1860. The coefficients in column (1) reports the effect on the share of free blacks on the black population. Column (2) reports the effect on the share of free blacks on the overall population. Column (3) reports the effect on the ln of the free black population. Each regression includes county and year fixed effect, trends in distance from the North and census regional trends. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A few possible mechanisms can explain these outcomes. Changes in the number of free blacks could be the result of either migration or changes in local demographic patterns. The former could be explained by economic considerations (free blacks moving to economic opportunities) or immaterial ones (free blacks moving toward counties were the pro-slavery/ anti-free black ideology was lower). The latter could be the result of changes in fertility rates or changes in manumission rates.

Several economic drivers could explain the observed patterns. We study the role of cities and proximity to rivers. Urban areas not only offer better job opportunities but are also places where it is easier to pass as unperceived and move in as foreigners or fugitive slaves. Finally, navigable rivers were a fundamental source of income for the free black population (see Berlin, 1974 for a discussion).

In Appendix A.1.15.5 we study the relevance of each one of these mechanisms. Estimates show that the results do

not seem to be driven by economic factors. We further show that fertility can not be held responsible for the observed patterns. These results seem to indicate that the differential changes in the free population are better explained by either changes in manumission rates in counties that suffered a loss in the comparative advantage for cotton or free blacks moving to places less hostile to their presence.

1.8 Discussion of Potential Mechanisms

Our results show the joint transformation of the economic, political, and social environment behind slavery in the US South. Two main mechanisms can explain the results. First, selection could be the primary driver of the political transformation: slave-owners migration could lead to changes in the political equilibrium. Second, changes in the preferences or constraints faced by the local population could determine changes in the observed outcomes. This can be the result of a decrease in the political control exerted by local planters or changes in preferences induced by cognitive dissonance.

1.8.1 Selection, Age and Gender Structure

In this section, we investigate the proportion of slave relocation and of changes in voting behavior explained by slave-owning household migration. First, we explore differences in the effect of land-rank on the age and gender structure across slave and non-slave-owning households. Significant differences in the distribution of age and gender across salve-ownership status would imply significant differences in migratory patterns, therefore indicating selection as an important mechanism behind the movement of slaves and changes in voting behavior. Appendix A.1.15 reports the effect of land-rank on age and gender structure, and several moments of the distribution of slaves per slave-owning households. The estimates show a large reduction of the number of slaves per household along all the distribution as a consequence of changes in Land-Rank. Also, gender and age structure is affected, suggesting that changes in comparative advantage affected incentives to migrate to young males. However, table 10 column (1-3), show that the propensity to migrate determined by land-rank does not differ from members of slave-owning households and members of non-slave-owning households, indicating a limited role for selection as an explanation for our results.

Second, we quantify the importance of the selection channel estimating the upper-bound of the effect passing through slave-owners migration. Table 10 shows the effect of LR_{it} on the presence of slave-owners (4-6),[49] and on the share of votes for the democratic party during the same period (7-8). To compute the share of the decrease in slaves explained by migration, consider the decline in the number of slave-owning households (164) determined by LR_{it}. A decrease in the number of slave-owning households can result either from migration or from households selling their slave. Assuming that all the 164 households left the county and that these were the 164 largest slave-owning households since the average slave-holding household within the top 164 in 1830 had 14 slaves, we obtain that migration can explain at most 70% of the decline in the number of slaves, $(164 \times 14)/3188 = .72$. Furthermore, we can compare the change in the share of votes in favor of the Jakcsonian / Democratic party to the decline in the number of slave-holding households. Given that the average number of potential voters (white male above 19 years old)[50] per slave-holding household is 1.375 as opposed to 1.25 in non-slave-holding ones, a drop in one pp. in the share of slave-holding families implies at most 1.1 pp. change in the share of votes for the Jakcsonian / Democratic party. Therefore, a change in 10.6 pp. in the share of slave-owning households can account for 11.7 pp drop in the share of votes. Estimates in table 10 indicate that migration can account for at most less than a third of the effect for the presidential election and one-fifth of the effect in the gubernatorial election.[51]

[49] We only report the change from 1830 to 1840 because these are the only two decades for which we have both household-level data and significant differences across parties in their voting behavior on slavery.

[50] The age categories allow aggregation from 20 years old on.

[51] $1.375/1.25 = .11$ so a drop of 10.6 pp in the share of slave-holding household leads to a drop in the share of votes of $10.6 \times 1.1 = 11.7$pp ca.

Table 10: Migration, Slave Relocation and Voting Behavior

	Male (26-44) per Households			Slave Relocation			Electoral Results	
	Slave Owners	Non Slave Owners	Difference	% of Slave Households	N. of Slave Households	N. of Slaves	% Democrats (Presidential)	% Democrats (Gubernatorial)
LR_{it}	0.0210***	0.0181***	0.003	-0.107***	-164.4***	-3186.0***	-0.364***	-0.580***
	(0.00517)	(0.00381)	(0.006)	(0.0325)	(49.90)	(538.2)	(0.131)	(0.127)
Observations	2034	2034	2034	1214	1214	1214	1442	1307
Mean				0.381	353.0	2911.9	0.545	0.529
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region * Y FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ln(Dist.)* Y FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	1810 - 1840	1810 - 1840	1810 - 1840	1830 - 1840	1830 - 1840	1830 - 1840	1832 - 1840	1830 - 1840

Note: The table shows the effect of LR_{it} on the proportion of white males between 26 and 44 years old across slave-owning and non-slave-owning households. The dependent variables are the total number of males of age between 26 and 44 in a given county divided by the total number of households (1-3), reported by slave-owning status. Column (3) reports the difference and standard errors of the difference between the estimates across slave and non-slave-owning households. In Columns (4-7), dependents variables are the share of slave-owning households, the number of slave-owning households, and the number of slaves by county between 1830 and 1840. In columns (8-9), the share of votes in favor of the Jakcsonian / Democratic party in the presidential and gubernatorial election, between 1830 and 1840. Each regression includes county and year fixed effect, and trends in the distance from the North, and the interaction between year FE and census region FE. Robust Standard errors, clustered at the county level are in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

1.8.2 Voting Behavior, Coercion, and Public Goods

A second hypothesis is that the local planters controlled the political system through a paternalistic mix of coercion and private provision of public goods.[52] Counties that lost economic relevance to the planters also became less attractive from a political point of view. This reduced incentives to patronage. Estimates in table 11 show a strong reduction of the presence of planters (households with at least 50 slaves)[53] given a change in LR_{it}. The decline of planters is accompanied by a strong increase in voters turnout. These results are considerably larger in States without franchise restriction.[54] Columns (3-4) in table 11 show large differences in the share of votes cast as a share of the male adult population (up to 30 pp.) given a unit difference in LR_{it}. In appendix A.1.15, we provide additional evidence in favor of this hypothesis. We look at public good provision. Although limited in scope and only available for the 1850 census, our estimates show that counties with higher relative productivity (RP_i) in 1850 had a higher

[52] The notion of paternalism has a long tradition in the scholarship on slavery. See for example Fox-Genovese (2005). The term has also been used to describe the labor relation in the postbellum agrarian South by Alston and Ferrie (1993).

[53] A drop of 2.6 pp. over a sample mean of .08 percent. An effect three times larger the mean.

[54] By the 1820s, only Virginia and North Carolina imposed property qualifications. These restrictions remained in place until, respectively, 1850 and 1856. Mississippi and Louisiana required voters to be taxpayers to access the ballot until 1832 and 1845 (Engerman and Sokoloff, 2005). Even so, the actual votes cast between 1828 and 1860 show a very large share of voters: on average, 70% of the adult (above 20 years of age) male population cast a ballot. Estimates in table 11 are computed for States and periods with no franchise restriction.

level of schooling, literacy rates, and books in libraries.[55] These results are consistent with a view in which individuals in counties that are no more under the control of planters are less constrained in their political and social behavior.

Table 11: Planters and Electoral Tournout

	Planters		Turnout	
	N. of Planters	% of Planters	Presidential	Gubernatorial
LR_{it}	-18.23***	-0.0271***	0.291***	0.300***
	(2.242)	(0.00307)	(0.111)	(0.101)
Observations	2128	2128	2032	2235
Mean	5.732	0.00788	0.767	0.695
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Region * Year FE	Yes	Yes	Yes	Yes
ln(Distance North) * Year FE	Yes	Yes	Yes	Yes

Note: The table shows the effect of LR_{it} on the number of planters and the electoral turnout. Planters are defined as those households owning at least 50 slaves. Turnout is computed as the ratio between the casted ballots and the number of white males with more than 20 years of age. Only states and years when the franchise was not restricted are included. Virginia and North Carolina imposed property qualifications until, respectively, 1850 and 1856. Mississippi and Louisiana required voters to be taxpayers, respectively, until 1832 and 1845. All the regressions include county and year fixed effect, and trends in the distance from the North, and census regional trends. Robust Standard errors, clustered at the county level are in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

1.8.3 Cognitive Dissonance and Social Norms

Finally, a possible interpretation of the results follows the idea that changes in the economic environment, by affecting the decision to own a slave, lead to changes in individual beliefs on the institution of slavery. Central to this notion is the theory of *cognitive dissonance*.[56] According to the theory, when individuals are incentivized to act in a manner that is contrary to their beliefs, individuals experience discomfort and adjust their beliefs to minimize the dissonance between their actions and their beliefs. These models predict that attitudinal changes can be a consequence of behavioral changes, rather than their precondition. We interpret the action of owning a slave as behavior involving a certain cognitive cost, which is accommodated with the production of belief on the justifiability of the institution. Motivated beliefs lead to the emergence of interdependence on how people think, determining collective values and social norms. The case of slavery is emblematic of such interdependence since an agent's payoff is a function of his own action (holding slaves) and the group's average action. A community with a "healthy" slave system not only reassure the individual slave owner about the economic demand for his assets but also implies a series of positive spillover related to his social image. Such interdependence reinforces themselves through horizontal and intergenerational transmission (Bisin and Verdier, 2001). A decline of the local importance of the slave economy can, therefore, reduce

[55] Consistently, Clegg (2019), using newly digitalized census information for both 1850 and 1860, has shown that wages were systematically higher in plantations counties with respect to the rest of the South, suggesting that patronage relationship implied better working conditions for the local white population.

[56] First proposed by Festinger (1957) and later introduced in economics by Hirschman (1965) and by Akerlof and Dickens (1982). For more recent works in economics, see Konow, 2000 and Di Tella et al., 2015b.

the need for the production of beliefs in favor of slavery, reduce the social costs involved in deviations from pro-slavery behavior, and eventually, through generations, can lead to the demise of the pro-slavery ideology. Changes in the demand for pro-slavery ideology captured by newspaper behavior and changes in the number of free blacks are best interpreted under this perspective.

1.9 Conclusion

This paper analyzes the impact of changes in agricultural comparative advantage on the economics and politics of slavery. Exploiting one of the key phenomena in American history, the Westward territorial expansion, we find strong evidence in support of economic determinants of the political support for slavery in the Antebellum South. The incorporation of new land to the US territories brought a change in the quantity and quality of agricultural land, shifting incentives to the use of slave labor and pushing counties losing comparative advantage in slave intensive crops to sell their slaves to the new and better-placed counties in the West. The paper shows that this economic transformation had a profound impact on Southern politics leading to a process of polarization that started decades before the Civil War.

Using evidence from Congressman voting behavior, Presidential and Gubernatorial elections, we estimate the effect of a decline in the local slave economy on political support for slavery. We document that both the Jacksonian and Democratic parties voted systematically more in favor of slavery and show that declining economic conditions for slavery led to a decline of the support for these parties and to changes in Congressman behavior itself. We further analyze the link between the economics and politics of slavery. We show that local newspapers changed their coverage of slavery in opposite ways, depending on their political affiliation when exposed to the same economic change. Finally, we show that the free black population increased as a consequence of the decline of the slave economy.

Although restricted to the US South, our analysis suggests that the political and institutional transformation that characterized slavery during the nineteenth-century developed within an economic environment, which was both non-economically reliant on salve labor and carried competing political-economic interests.

A.1.10 Appendix A

A.1.10.1 Secession Conventions Votes

For the states of Georgia, Alabama, we compute the share of votes in favor of secession as the share of delegates voting in favor of secession. For the state of Arkansas, because the secession ordinance was voted only at war already started, we follow Wooster (1956) and study the voting for the Hanly Motion. Thomas B. Hanly proposed an ordinance of secession to go into effect only when ratified by the people of the state in a popular vote. We consider the vote in favor of the Hanly's motion as a vote held by the cooperativist and rejected by the immediate secessionist. Also in the case of Florida we follow Wooster (1958). We uses the Allison motion to distinguish between the cooperativist and the secessionist. The Allison motion, similarly to the Hanly motion, proposed that the secession ordinance proposed by the committee should not take effect until Georgia and Alabama had seceded. The immediate secessionists would vote against the amendment. For Louisiana we obtained the returns of the election of convention delegates from Dew (1970). The candidates were running either as cooperativists or as secessionist. We compute the share of the votes in favor of the secessionist. As for Louisiana, in the case of Mississippi, we use the return from the elections of the convention delegates and compute the share of votes for the secessionist candidates. The information are taken from Rainwater (1938).

A.1.10.2 Congressional Votes Regarding Slavery

In order to build the roll-call voting regarding slavery we analyzed the 10,640 votes in the House of representatives between the 11th Congress (1809-1811) and the 36th Congress (1859-1861) using the voteview database Poole and Rosenthal (1985). We then focused on the 733 votes that voteview identifies as pertaining "Civil Liberties" or "Domestic Social Policy". We then manually selected the 222 votes regarding the slavery. Common issues voted in the House regarding slavery are fugitive slaves laws, the expansion into new territories and states of slavery, Slavery in DC, the extent of federal power over slavery state-rights and even the reopening of the transatlantic slave trade. For each of the 222 votes we then found the text of the law that was being voted. For votes between the 11th and the 18th the text can be found in the "Annals of Congress", between 19th and the 25th in the "Register of Debates" and after that in the "Congressional Globe". All can be accessed from the library of Congress. For each vote we first tried to determine whether voting yea or nay should be considered pro-slavery. When the uncertain and as a validation device we use the direction of the vote of Congressmen from the North of the US. The assumption behind this decision is that if for example voting yea for a specific vote is to be interpreted as voting in favor of slavery then Congressmen from the North should vote less often yea than Southern Congressmen.

A.1.11 Theories Regarding the Choice of Labor Inputs

The view championed by Fogel and Engerman (1974) argues that certain crops were more suited for the use of slave labor because of the intensity of the working conditions. The authors have pointed in particular to the use of the gang labor system: workers deployed in assembled lines of "highly disciplined, interdependent teams capable of maintaining a steady and intense rhythm of work."[57] Because cotton and sugar were particularly suited to the use of the gang labor system, these crops displayed a high concentration of slaves in their cultivation. Fenoaltea (1984) made a similar argument. He maintained that certain sectors had a prevalence of slave labor because the specific operation to be performed were better conducted by workers motivated by anxiety, rather than reward. He argued that slaves were overseen in gangs because gangs are necessary to "maintain high levels of anxiety: only gang slaves can be subjected to the constant and immediate threat of the lash."[58]

Gavin Wright (Wright and Kunreuther, 1975; Wright, 1979) has rejected these ideas and showed that the large share of slaves in cotton production can be explained by the risk of growing cotton at the expense of food crops

[57] Quote from Hanes, 1996, p. 308
[58] Fenoaltea, 1984, p. 667

for home consumption. Market-oriented, slave-rich farms were in a better position to take the risk and therefore displayed a higher level of specialization in cotton production. Hanes (1996) criticized the gang-labor approach on the following ground. "The arguments of Fenoaltea and Fogel and Engerman cannot explain why many farmers chose to employ only a few slaves, often just one or two. On small farms, a slave worked alongside family members, performing similar tasks in similar ways.[..] Most importantly, tobacco was not a gang-labor crop. Thus, as Galenson (1984) noted, a theory of slave distribution based on the use of gang labor cannot explain the rise of slavery in Virginia and Maryland."[59]

Earle (1978) argued that the seasonality of the labor requirement represents the primary determinant of the advantage of slavery vs. free labor in the cultivation of specific crops. He maintains that the sunk costs involved in slave-ownership are better recovered if the seasonality of the labor required by the cultivated crop covers a high proportion of the year. According to Earle (1978), "Wage labor was competitive for part of the year, but never on an annual basis. Farmers who needed labor for a few days, weeks or months, found the use of hired labor decidedly cheaper and more efficient economically than slaves. The decisive factor in the farmer's choice of either slave or free labor came down to the annual labor requirements of his staple crop: crops such as wheat, which required only a few weeks of attention, lent themselves to wage labor; whereas crops such as tobacco or cotton, which demanded sustained attention during a long growing season, lent themselves to slave."[60]

In a complementary view, Hanes (1996) argued that the "sectors that tended to employ slaves in the British American colonies and the antebellum South were the ones in which employers faced especially high turnover costs."[61] The seasonality of the labor requirement, in the form of the number of peaks of labor required during the year, is the main feature that would explain the advantage in the production with slave labor in certain crops. The higher is the number of peaks in the labor requirement; the higher are the cumulated transaction cost the employer will have to face over the year and therefore the turnover cost in the case of free labor employment. This same argument has been re-proposed by Wright who noticed that "there is [. . .] an element of truth in the linkage between cotton's labor requirement and slavery, which has to do with the crop's distinctive seasonality. Because cotton needed so much attention early in the season for planting, weeding, and "chopping", there were typically two labor peaks during the crop year. [...] The important point is that both labor peaks had to be fulfilled for success in cotton growing. It is not difficult to see that year-round ownership of slave labor had a certain advantage in this regard." (Wright, 2006 p. 87) Fig. A.4 illustrate the argument comparing the seasonality of the labor requirement in cotton and wheat. Figure A.5 and table A.12 show that the argument is consistent with the available evidence from the farm sample of the 1860 Agricultural Census provided by Gallman and Parker (1976). On the one hand, cotton has two peaks of labor requirement, which makes the staple's turnover cost high. On the other hand, wheat has a unique three weeks peak which makes it relatively less suitable for slave labor.[62] Further insights are given by the length of the growing season. While Cotton (but also Sugar and Tobacco) requires a high amount of attention during the year,[63] Wheat and other grains' needs are concentrated during the harvest season, which corresponds to a two to three weeks single peak of labor requirement. To put it in (Genovese, 1989, p.49)'s terms: "Slavery requires all hands to be occupied at all times."[64] Crops such as cotton, tobacco and sugar provided slave-owners with an advantage in the fulfillment of this task.

The views expressed so far can be summarized in two main theories. On the one hand, the idea that slaves but not free laborer can be subjected to a system of labor organization that allows high level of efficiency gains through the imposition of high level of labor intensity. On the other, the idea that property rights in labor allow the reduction of the cost (sunk, turnover or risks) involved in risky commercial activities. Whether the heterogeneous distribution

[59] Hanes, 1996, p.309
[60] Earle, 1978, p. 51.
[61] Hanes, 1996, p. 309
[62] As noted by Wright (2006), the seasonality of labor requirement in the early 20th century represents a lower-bound of the contrast between the two crops because of the mechanization involved in the production process at the time these figures were compiled.
[63] For example, Cotton's growing season needs at least two-hundreds frost-free days
[64] Anderson and Gallman defend Genovese's assertion in Anderson and Gallman, 1977

of slave labor has to be explained by one or a combination of several arguments, cotton and wheat represent the most relevant examples of crops relatively better suited for the use of slave labor and free labor.

On the one hand, cotton has been regarded as the quintessential of the gang labor crops, as opposed to wheat[65]; on the other, the specificity of the seasonality of cotton and wheat implies that turnover costs in cotton are larger than in wheat.[66] Moreover wheat could be consumed in case of bad crops which mitigate the commercial risks involved in cotton production. In conclusion, under these theories, cotton production has an advantage in the use of slave labor with respect to wheat and therefore this has to be reflected in the allocation of slaves in the Antebellum South. We expect that changes in the local comparative advantage in the production of cotton with respect to wheat lead to changes in the local use of slave labor.

A potential caveat of a theory linking agricultural comparative advantage and slave labor allocation is given by the nature of the slave market. A very active rental market would mitigate the need to adjust the stock of slaves in case of changes in the crop mix. Most of the available evidence indicates that rural rental markets were negligible with respect to the overall slave market. Friedman and Manning (1992) consider that the overwhelming majority of slaves lived and worked on property owned by their owner. Slave hiring was most widespread in urban areas, while - again according to Friedman and Manning (1992) - 6 % should be considered an upper-bound of the number of slaves rented in rural areas.[67]

A second concern may be raised by the slave market liquidity: evidence that slaves were bought and sold over a very short period of time. Even if it is difficult to make quantitative statements regarding the frequency of slave purchases, scholars seem to discard the importance of frequent trade to make short-term adjustments. Anderson and Gallman (1977) claim that a "slaveholder was unlikely to make an adjustment to short-lived variations in the activities of his enterprise through the purchase and sale of fixed assets [slaves]; the risks and costs of such behavior were too large".

There are several economic reasons in support of this view. Firstly, only highly differentiated local economies could provide the condition for local demand to meet local supply. There is ample evidence against this argument since the economy was highly specialized (Fiszbein, 2016). Secondly, the cost of transactions involved markups appropriated by slave traders and transaction costs associated with quality assessment.[68] To put it in Hanes (1996) terms, buying a slave determined a "lemons" problem and the associated cost derived by adverse selection. These characteristics of the slave market reinforce the idea that structural changes in the crop mix should result in the adjustment of the slave stock.

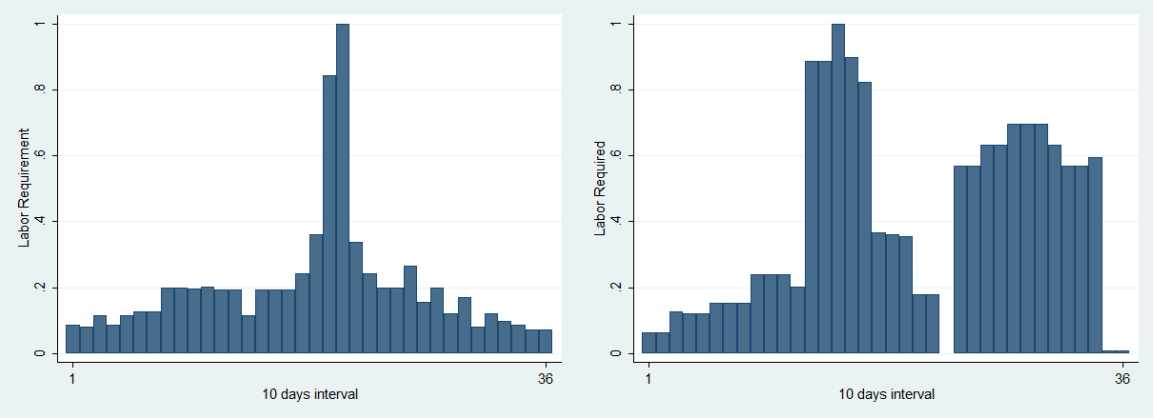
[65] Wheat does not require the fulfillment of tasks that can be organized in gangs but for a two weeks during the harvest period, it cannot therefore be considered a gang labor crop.

[66] It is important to mention that our argument is not to be considered in absolute terms, but in relative ones. We do not maintain that Wheat and slavery are incompatible per se - counterexamples have been shown in the case of Piedmont Virginia by Irwin (1988).

[67] The number has been computed in by Goldin (1976) for the case of rural Virginia

[68] Evans (1961) estimated the costs of relocating slaves, which include brokerage fees, maintenance, the cost of runaways, and the unproductive period during the trades. Brokerage fees and costs of runaways, which do not exist in the case of free labor, may have made the cost of migration greater for slaves than for free men. Cf. EM, n. 35 in Friedman and Manning (1992).

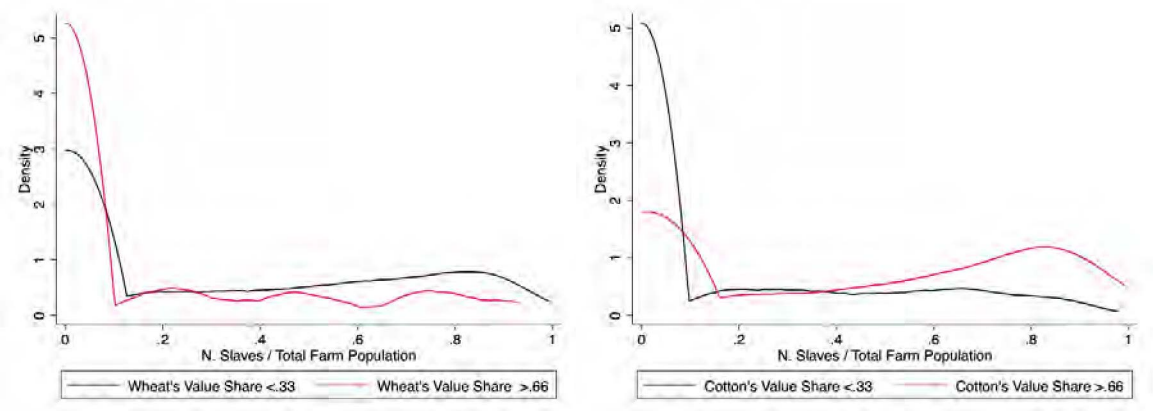
Figure A.4: Seasonality of Labor Requirement



(a) Wheat Labor Requirement (b) Cotton Labor Requirement

The Figure represents the seasonality of labor requirement for wheat and cotton in the case of Washington and Georgia respectively as reported by the US Department of Agriculture in 1919. *Source: Yearbook of the Department of Agriculture, 1917 p. 545-46. in Wright (2006).*

Figure A.5: Share of Slaves at Farm Level



(a) By Share of Value in Wheat (b) By Share of Value in Cotton

The Figure represents the distribution of the share of slaves per farm by crop production. The left panel represents the distribution in farms whose share of wheat in the gross value of farm output is less than 33% and more than 66%. The right panel represents the distribution in farms whose share of cotton in the gross value of farm output is less than 33% and more than 66%. *Source: Gallman and Parker (1976) subsample from 1860 Agricultural Census.*

Table A.12: Cotton, Wheat and Slavery at the Farm Level

	Bales of Cotton	Share of Slaves	Slave per Acres
	(1)	(2)	(3)
Bushels of Wheat	-0.0164***		
	(0.00626)		
Bushels of Rye	-0.0677*		
	(0.0347)		
Bushels of Corn	0.0300***		
	(0.000584)		
Bushels of Oats	-0.0180***		
	(0.00594)		
Bushels of Rice	-0.000174		
	(0.000515)		
Pounds of Tobacco	-0.00375***		
	(0.00101)		
Share of Rye		-0.0323	-0.275
		(0.0285)	(0.208)
Share of Wheat		-0.0218***	-0.377***
		(0.00548)	(0.0395)
Share of Tobacco		-0.00971	-0.251***
		(0.00998)	(0.0726)
Share of Rice		0.0147	0.310
		(0.0287)	(0.189)
Share of Corn		-0.0154***	-0.365***
		(0.00214)	(0.0155)
Share of Oat		0.00859	0.144
		(0.0166)	(0.121)
Observations	5228	5020	5038

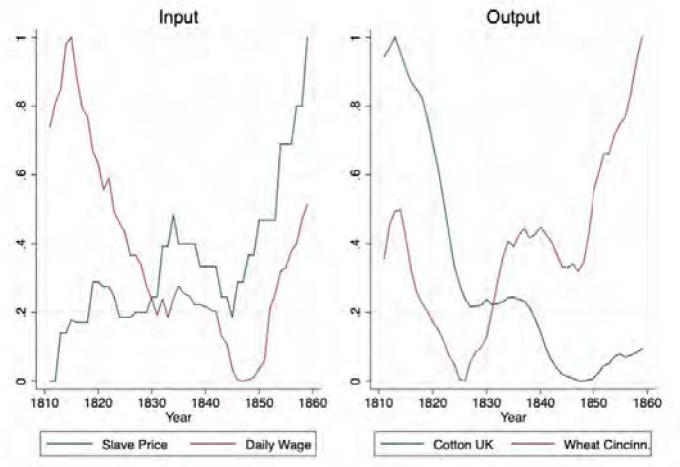
Note: Individual observations are farms. Column (1) reports the correlation between the size of cotton production and the size of the other crop produced. Column (2-3) have as dependent variables respectively the share of slaves as a fraction of the total population of the farm and the number of slaves divided by the number of acres. Independent variables are the share of crop's value produced on the farm. Omitted variable is the share of cotton. *Data Source:* Gallman and Parker (1976) subsample from 1860 Agricultural Census.

A.1.12 Robustness, Alternative Specifications and Mechanisms of Slave Relocation

A.1.12.1 Input and Output Prices

As an alternative method to study the effect of the Westward expansion on agricultural production decisions, we construct a measure of comparative advantage by combining the relative productivity of a county with information on the prices of inputs (slave labor and free labor) and outputs (cotton and wheat). The overall variation of these prices is displayed in Figure A.6. Between 1810 and 1860, slave prices increased substantially while the international price for cotton decreased. During the same period, wheat prices experienced the opposite trend. We expect counties to react differently to this common shock. In particular, we expect counties with low relative productivity between cotton and wheat (low RP) to no longer be able to endure the rising costs of producing cotton. Because of this, counties with a low RP will increase the production of wheat. As already argues, crop production decisions translate into labor input decisions.

Figure A.6: Prices Evolution



This figure shows the evolution of prices. The left table reports the moving average of slave prices and daily wages. Right table shows the moving average of UK cotton prices and Wheat Cincinnati prices. 0 is set to match the minimum and 1 the maximum of each price.

Table A.13 shows the result for this specification. As in Table 1 of the main manuscript, the outcomes of interest are the share of the enslaved population, the number of slaves per $1000Km^2$, and the number of slaves. We construct three different variables to capture how, depending on levels of RP_i, prices differently affected slave use. Prices are described in section 1.3 of the main manuscript.The first uses only the prices of the outputs (cotton and wheat) where the regressor of interest is $RP_i \times \frac{P_{cotton,t}}{P_{wheat,t}}$. The second uses only the prices of labor inputs (slave prices and wages of free laborers) where the regressor of interest is $RP_i \times \frac{Wages_t}{P_{slave,t}}$. Finally we combine the information on output and inputs with the following regressor $RP_i \times \frac{Wages_t/P_{wheat,t}}{P_{slaves,t}/P_{cotton,t}}$. We expect that counties with low RP as cotton production becomes less profitable reduce their use of slave labor. Therefore in all three specifications, we expect a positive estimate.

Table A.13: Slave Relocation - Input and Output Prices

	% Slaves			Slaves per 1000 km^2			N. Slaves		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$RP_i \times \frac{P_{cotton,t}}{P_{wheat,t}}$	0.0256***			478.2***			603.7***		
	(0.00269)			(42.65)			(60.39)		
$RP_i \times \frac{Wages_t}{P_{slave,t}}$		0.0219***			400.9***			510.4***	
		(0.00259)			(41.14)			(58.89)	
$RP_i \times \frac{Wages_t/P_{wheat,t}}{P_{slaves,t}/P_{cotton,t}}$			0.0233***			443.5***			556.6***
			(0.00270)			(42.58)			(61.37)
Observations	4471	4471	4471	4471	4471	4471	4471	4471	4471
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table shows the effect of changes in prices interacted with relative productivity on slaves' relocation. Output price are UK cotton price and wheat price observed in the Cincinnati market; Labor input prices are wages in West Virginia and slave prices. The ratios are standardized so that their minimum is zero and maximum is 1. Robust standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A.1.12.2 Old and New Counties

In our main specification, we estimate the effect of changes in comparative advantage without imposing any restrictions on the sample. In this way, we obtain an unbalanced panel in which the counties included in 1810 are observed five times, those included from 1820 are observed four times, up to the counties included in 1850, which are observed twice. Using the entire sample, we estimate the causal effect of changes in comparative advantage, both including counties losing comparative advantage and counties entering the US census at the top of the distribution of relative productivity. The results could, therefore, be driven by the comparison between counties that enter our sample at different times. Even though the issue is already partially addressed by including regional or state trends, we perform two additional exercises.

First, we restrict our attention to the counties included in the US in 1810 (old counties). Table A.14 report these estimates. The baseline results are confirmed when restricting our analysis to this balanced panel.

Second, we study the effect of relative productivity on the use of slave labor, focusing on counties that just started being inhabited (new counties). Focusing on the sample of new counties, we proceed as follows. We take counties at the frontier and set both the percentage and the numbers of slaves to zero. We then observe each county the first time is inhabited (Year 0) and follow it for two other decades (Year 10, Year 20). We expect that new counties with high relative productivity of cotton with respect to wheat will be the ones acquiring the most slaves. We test this hypothesis by estimating the following equation:

$$y_{i,t} = \alpha_i + \alpha_t + \sum_{j=0,10,20} \beta_j \times \mathbb{1}(Year\ \ j) \times \text{RP}_i + \epsilon_{i,t} \tag{3}$$

Figure A.7 shows the estimates of β_0, β_{10}, β_{20} from regression (4). RP_i has been standardized with mean zero and standard deviation 1 to make the interpretation of the parameters easier. Panel (a) establishes that in Year 0, each standard deviation increase in relative productivity increases by 6.6 p.p. the share of slaves. This effect increases over time, reaching 9.3 p.p. by Year 20. Panel (b) establishes that in Year 0, each standard deviation increase in relative productivity increases the number of slaves in a county by 288. The effect continues to increase over time, reaching 985 extra slaves by Year 20. Overall, the estimates reassure against the idea that the results are driven by the comparison between old land and new counties.

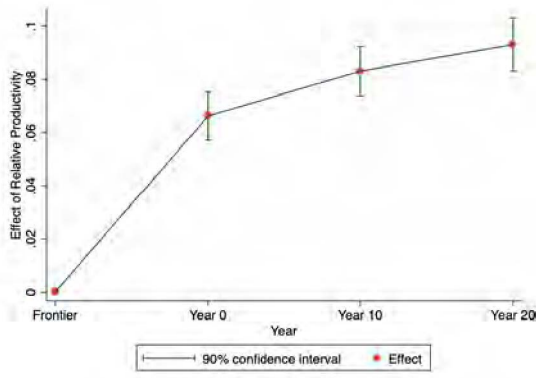
Table A.14: Slave Relocation - Old Counties

	(1) % Slaves	(2) Slaves per 1000 km^2	(3) N. Slaves
Land-Rank	-0.107***	-1450.5***	-2094.9***
	(0.00731)	(152.7)	(197.9)
Observations	2757	2757	2757
Adj. Within R^2	0.207	0.0877	0.137
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes

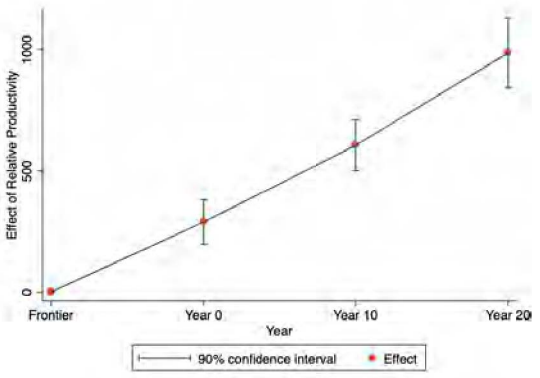
Note: This table shows the effect of changes in the land-rank on slaves' relocation between 1810 and 1860 restricting the sample to those counties not at the frontier in 1810. The variable of interest is $LandRank_{it} = \sum_{j=1}^{N_t} w_j I_{(RP_j \geq RP_i)}$ calculated in million Km^2 of land and $RP_i = \frac{A_i^{cotton}}{A_i^{wheat}}$. The county with the median RP in 1810 gained 0.942 land-rank between 1810 and 1860. The coefficients in columns (1) and (2) report the effect on the share of slaves with respect to the total population. Columns (3) and (4) report the effect on the number of slaves per 1000 Km^2 and columns (5) and (6) for the absolute number of slaves. Each regression includes county and year fixed effect, and trends in distance from the North. The odd columns include census regional trends, while even columns include state trends.

Figure A.7: New Counties

(a) Percentage of Slaves



(b) Number of Slaves



The figure plots the coefficients of the effect of relative productivity on the share of slaves (a) and number of slaves (b) over time. Counties at the frontier have a density inferior to 2 individuals per Km^2. Year 0 is the first observation after leaving the frontier status. Regression includes Regional FE × census year FE and ln(distance to the North) × census year FE.

A.1.12.3 Taking Into Account Sugar, Tobacco and Corn

In this subsection we replicate the results found in section 1.5.1 of the main manuscript including the other three main crops that have been reported to use slaves: tobacco, sugar and corn.

To adapt our regression to the inclusion of sugar and tobacco, we first calculate for each county the highest level of productivity between the cotton, sugar, and tobacco. Define absolute slave productivity as: $A_{slave} = max(A_i^{cotton}, A_i^{sugar}, A_i^{tobacco}, A_i^{corn})$. As in section 1.5.1 of the main manuscript, we focus on the relationship between land characteristics and crop production decisions. We then define the relative productivity of county i between slave crops and wheat as $RP_i = \frac{A_{slave}}{A_i^{wheat}}$. We say that county i has a comparative advantage in the production of slave crops with respect to county j if $RP_i > RP_j$. Using this new definition of relative productivity, we recompute the measure of land-rank of all counties at different census years. The effects of this new measure of land-rank on the use of slave labor are reported in Table A.15. In order to make the estimates directly comparable to Table 1 of the main manuscript, we standardize land-rank so that the county with median RP in 1810 gained 1 land-rank between 1810 and 1860. All the results are qualitatively unchanged. Losing comparative advantage in the production of slave crops implied a reduction in the use of slave labor.

Table A.15: Slave Relocation - Taking Into Account Sugar and Tobacco

	% Slaves	Slaves per 1000 km^2	N. Slaves
	(1)	(2)	(3)
Land-Rank	-0.0963***	-1865.7***	-2673.6***
	(0.0151)	(238.6)	(391.6)
Observations	4471	4471	4471
Adj. Within R^2	0.187	0.135	0.166
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes

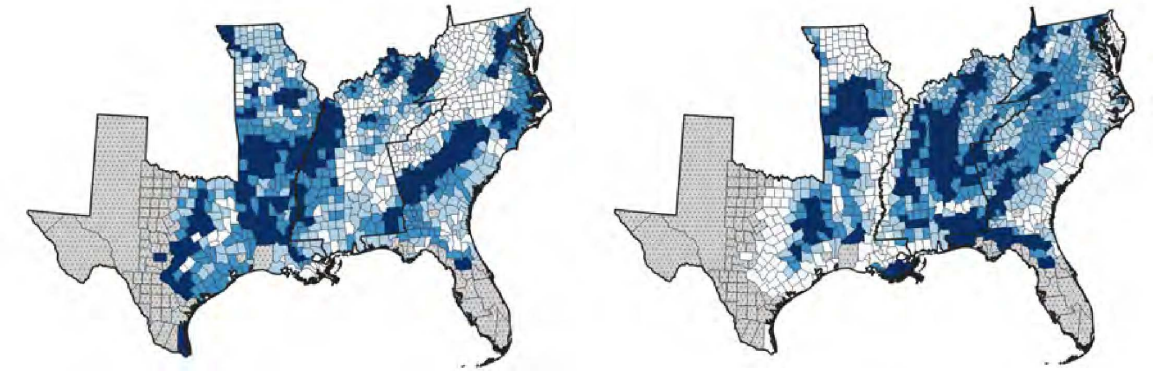
Note: This table shows the effect of changes in the land-rank on slaves' relocation between 1810 and 1860. The variable of interest is $LandRank_{it} = \sum_{j=1}^{N_t} w_j I_{(RP_j \geq RP_i)}$ calculated in million Km^2 of land and $RP_i = \frac{max(A_i^{cotton}, A_i^{sugar}, A_i^{tobacco}, A_i^{corn})}{A_i^{wheat}}$. The measure is then standardized so that the county with the median RP in 1810 gained 1 land-rank between 1810 and 1860. The coefficients in columns (1) report the effect on the share of slaves with respect to the total population. Columns (2) reports the effect on the number of slaves per 1000 Km^2 and columns (3) for the absolute number of slaves. Each regression includes county and year fixed effect, trends in distance from the north (the Mason-Dixon line) and census regional trends. Robust Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A.1.12.4 Exploiting Differences in Timing

In this section, we exploit the fact that counties highly suitable for cotton and tobacco are located in different geographical areas of the South. While land highly suitable for cotton is found in large quantities towards the West, land highly suitable for tobacco is located in a more central position. Therefore, land favorable to the cultivation of tobacco was inhabited before than land favorable to the cultivation of cotton. This feature of the distribution of crop-specific land productivity is depicted in Figure A.8.

Figure A.8: Geographical variation

(a) Cotton (b) Tobacco



Note: This figure shows the distribution of the suitability for cotton (panel (a)) and tobacco (panel (b)). The darkest counties are the highest quartile, lightest the lowest. Given the high correlation between these two suitability the figures display the residual of a regression where the other suitability is controlled for.

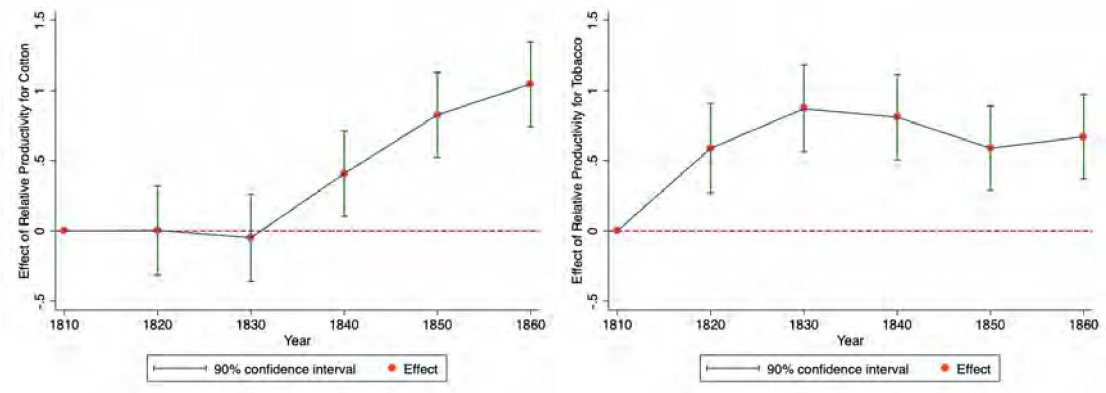
Given this variation, the argument expressed throughout the paper requires that tobacco productivity predicts better the use of slave labor in the first decades; then, when the inclusion of land highly suitable for cotton enters the market, cotton productivity should take over. We estimate the timing of the effect of tobacco and cotton using the following equation.

$$y_{i,t} = \alpha_i + \alpha_t + \sum_c \beta_c \text{RP}_i^c * 1(Year = t) + \epsilon_{i,t} \tag{4}$$

The omitted time dummy is the one identifying the year 1810. c is a subscript for tobacco and cotton. RP^c represents the relative productivity (standardized to have mean 0 and standard deviation 1) of crop c, divided by wheat suitability.

Figure A.9: Effects of Relative Productivity by Crop

(a) Cotton (b) Tobacco



Note: This figure shows the estimated β_{cotton} and $\beta_{tobacco}$ from equation 4.

In Figure A.9 panel (a) and (b) represents respectively β_{cotton} and $\beta_{tobacco}$ from regression 4. The results are in line with the proposed argument. Because the Westward expansion affected first market for tobacco, we see that the patterns of slave relocation follow first land highly productive in tobacco cultivation and only later land highly productive in cotton.

A.1.12.5 Within State Variation

In this section we replicate the results found in Table 1 of the main manuscript exploiting on variation in land-rank between year and within a state.

Table A.16: Slave Relocation - Within State Variation

	(1)	(2)	(3)
	% Slaves	Slaves per 1000 km^2	N. Slaves
Land-Rank	-0.0699***	-1259.8***	-1871.1***
	(0.0144)	(260.6)	(384.9)
Observations	4471	4471	4471
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
State * Year	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes

Note: This table shows the effect of changes in the land-rank on slaves' relocation between 1810 and 1860. The variable of interest is Land-Rank$_{it} = \sum_{j=1}^{N_t} w_j I_{(RP_j \geq RP_i)}$ with $RP_i = \frac{A_i^{cotton}}{A_i^{wheat}}$. The measure Land-Rank$_{i,t}$ is standardized so that the county with the a median RP in 1810 gained 1 Land-Rank$_{i,t}$ between 1810 and 1860. The coefficient in column (1) reports the effect on the share of slaves with respect to the total population. Column (2) reports the effect on the number of slaves per 1000 Km^2 and column (3) for the absolute number of slaves. Each regression includes county and year fixed effect, and trends in distance from the North and State trends. Errors clustered at the county level are shown in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A.1.12.6 Controlling for other Mechanisms

Table A.17: Mechanism - The Role of Navigable Rivers

	% Slaves	Slaves per 1000 km^2	N. Slaves
	(1)	(2)	(3)
Land-Rank	-0.108***	-1907.8***	-2630.1***
	(0.0134)	(223.6)	(338.2)
Ln Distance to Navigable River	-0.00124	-144.2***	-149.2***
	(0.00190)	(33.84)	(53.95)
Observations	4471	4471	4471
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes

Note: This table shows the effect of changes in the land-rank on slaves' relocation between 1810 and 1860. The variable of interest is Land-Rank$_{it} = \sum_{j=1}^{N_t} w_j I_{(RP_j \geq RP_i)}$ with $RP_i = \frac{A_i^{cotton}}{A_i^{wheat}}$. The measure Land-Rank$_{i,t}$ is standardized so that the county with the a median RP in 1810 gained 1 Land-Rank$_{i,t}$ between 1810 and 1860. The coefficient in column (1) reports the effect on the share of slaves with respect to the total population. Column (2) reports the effect on the number of slaves per 1000 Km^2 and column (3) for the absolute number of slaves. Each regression includes county and year fixed effect, and trends in distance from the North and census regional trends. Errors clustered at the county level are shown in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. *Ln distance* is computed as the distance between each county's centroid and the closest navigable river. All the estimates include Robust Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

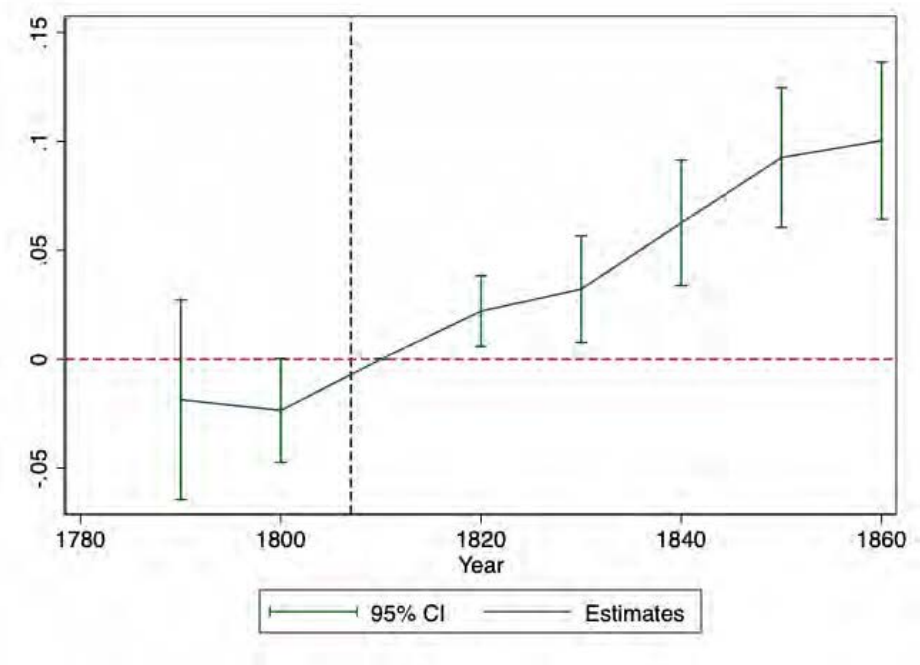
Table A.18: Mechanism - The Role of Farm Value

	Ln Value of Farms	Ln Value of Equipment	% Slaves		
	(1)	(2)	(3)	(4)	(5)
Land-Rank	0.886***	1.057***	-0.0959***	-0.0990***	-0.103***
	(0.291)	(0.293)	(0.0293)	(0.0298)	(0.0287)
Ln Value of Farms			0.0411***		0.0317***
			(0.00516)		(0.00515)
Ln Value of Farm Equipment				0.0374***	0.0151***
				(0.00572)	(0.00554)
Observations	1934	1934	1934	1934	1934
County FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes	Yes

Note: This table analyses the relationship between LR_{it} and the value of the farm between 1840 - 1860. Ln Farm Value and Ln Value of Equipment are respectively the log of the cash value of the farms and the log of the agricultural equipment value in a given county. All regressions include county and year fixed effect, trends that vary with distance from the North and Region trends. Robust Standard errors, clustered at the county level are in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A.1.12.7 Pre and Linear Trend

Figure A.10: Event Study



Note: The figure shows the effect of relative productivity on the share of slaves per year. Excluded year is 1810. The estimated model includes interaction between year FE and region FE, interaction between distance from the northern border and year FE. Dashed line represents the year of the abolition of the Atlantic Slave Trade (1808).

Table A.19: Pre Trend (1800) Share of Slaves

	(1)	(2)	(3)
	% Slaves	Slaves per 1000 km^2	N. Slaves
Land-Rank	-0.110***	-1620.2***	-2468.5***
	(0.0170)	(296.5)	(510.4)
Observations	2328	2328	2328
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes
% Slaves 1800 * Year	Yes	Yes	Yes

Note: This table reproduces the baseline table including trend in the share of slaves in 1800. The variable of interest is Land-Rank$_{it} = \sum_{j=1}^{N_t} w_j I_{(RP_j \geq RP_i)}$ with $RP_i = \frac{A_i^{cotton}}{A_i^{wheat}}$. The measure Land-Rank$_{i,t}$ is standardized so that the county with the a median RP in 1810 gained 1 Land-Rank$_{i,t}$ between 1810 and 1860. The coefficient in column (1) reports the effect on the share of slaves with respect to the total population. Column (2) reports the effect on the number of slaves per 1000 Km^2 and column (3) for the absolute number of slaves. Each regression includes county and year fixed effect, and trends in the distance from the North, census regional trends and trends in the share of slaves in 1800. Robust Standard errors, clustered at the county level are in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.20: De-trended Outcome, Log Transformation, and County Specific Linear Trend

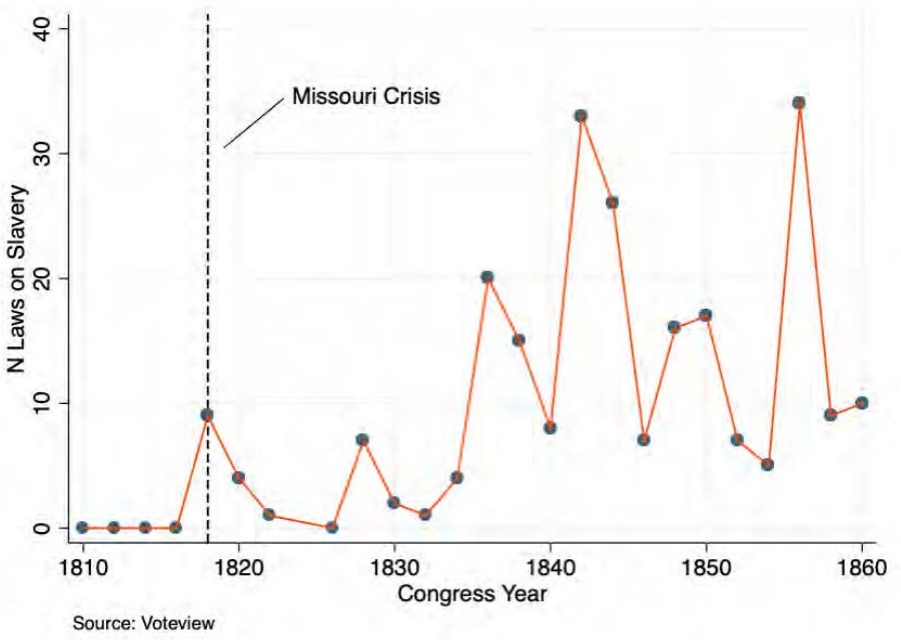
	% Slaves			
	(1)	(2)	(3)	(4)
Ln. Land-Rank	-0.182***	-0.131***	-0.166***	-0.0833*
	(0.0236)	(0.0465)	(0.0347)	(0.0467)
Observations	4534	4534	1718	1718
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	No
ln(Distance North) * Year	Yes	Yes	Yes	No
Detrended Dep. Var (1790-1800)	No	No	Yes	Yes
County Specific L.T.	No	Yes	No	Yes
Years	1810-1860	1810-1860	1810-1860	1810-1860
Sample	Full	Full	Inhabited since 1790	Inhabited since 1790

Note: This table shows the results when we use a log transformation of Land-Rank. The outcome variable is the share of slaves in all regressions. Column (1) reports the baseline regression, with county FE, year FE, Region times year FE and distance from North and year FE, when the independent variable is the log of Land-Rank. Columns (2) includes county-specific linear trends. Column (4) has as outcome variable a the value of the share of slaves de-trended with respect to the change between 1790 and 1800. Column (4) includes both linear trends and de-trended outcomes. Robust Standard errors, clustered at the county level are in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A.1.13 Politics: Additional Results

A.1.13.1 Figures

Figure A.11: Slavery Debate



This figure shows the evolution of the debate on slavery in Congress. The y-axis reports the number of laws concerning slavery per Congress. The dashed line represents the Missouri Crises.

A.1.13.2 Tables

Table A.21: Legislator's Ideology - Senate

	Nominate - NP	Nominate	Position
Land-Rank	-4.322**	-2.996*	-6.114*
	(1.680)	(1.609)	(3.287)
Observations	754	754	754
Cong. District FE	Yes	Yes	Yes
Congress Num. FE	Yes	Yes	Yes
Region * Cong.	Yes	Yes	Yes
ln(Distance North) * Cong.	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table shows the effect of Land-Rank$_{it}$ on three different measures of Ideology for the Senate. Nominate, measures the ideology of each legislator for every congress (every 2 years). Nominate - NP, measures the ideology of each legislator based on the whole roll-call career of a legislator. Position, for each congress measures the rank of each legislator in the distribution of ideologies. For all measures, higher scores imply a more conservative ideology. All measures are measured between 0 and 100. All regressions include county and year fixed effect, regional trends and trends varying with distance from the North.

Table A.22: Parties' Ideology

	Nominate Score		Party Activity		
	Mean	S.d.	First Year in Congress	Last Year in Congress	Tot. Seats
			Panel A		
Democrat	.3100214	.0037918	1838	1860	593
State Rights	.3379281	.0122688	1852	1852	3
Nullifier	.3405403	.0168177	1832	1838	21
Union	.3447051	.0206817	1852	1852	11
Ind. Democrat	.38544589	.04133	1852	1860	8
Crawford Republican	.3871434	.0130997	1824	1824	17
Conservative	.3921037	.0575023	1840	1840	2
Jackson Federalist	.4316181	.	1824	1824	1
Jackson	.4386941	.00651896	1826	1836	258
Jackson Republican	.4899344	.02255769	1824	1824	31
Democrat-Republican	.4906124	.00586592	1810	1822	307
			Panel B		
Whig	.5257777	.0055872	1838	1854	256
Adams-Clay Federalist	.5589049	.	1824	1824	1
American	.5650793	.01188684	1856	1860	47
Opposition	.5765628	.03890863	1856	1856	5
Anti-Jackson	.5930719	.0139106	1830	1836	73
Ind. Whig	.6140355	.	1852	1852	1
Crawford Federalist	.6444843	.032572	1824	1824	2
Adams	.6492928	.01673307	1826	1828	29
Federalist	.6622379	.01724847	1810	1822	41
Adams-Clay Republican	.6726916	.02127854	1824	1824	10

Note: The table reports the mean and s.d of the Nominate score for all the parties with at least one member elected in the Congress from 1810 to 1860, ordered from the lowest DW-Nominate score to the highest. We also report the first and last years in which the party was represented in Congress and the total number of seats it had during the entire period of activity. The table is divided into two groups representing the two opposing factions in Congress for a given period of time. *Data Source:* Lewis et al. (2019)

Table A.23: Legislator's Ideology

	Nominate - NP (1)	Nominate (2)	Position (3)	Nominate - NS (4)	Nominate - NP (5)	Nominate (6)	Position (7)	Nominate - NS (8)
Land-Rank	-12.94***	-13.09***	-28.12***	-10.86**	-11.43***	-10.59***	-23.76***	-7.155**
	(3.228)	(3.453)	(7.439)	(4.935)	(2.417)	(2.688)	(6.041)	(3.323)
Observations	1575	1575	1575	1575	1570	1570	1570	1570
Cong. District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Congress Num. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region * Cong.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ln(Distance North) * Cong.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Party * Cong.	No	No	No	No	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table shows the effect of Land-Rank$_{it}$ on four different measures of Ideology for the House of Representatives. Nominate, measures the ideology of each legislator for every congress (every 2 years). Nominate - NP, measures the ideology of each legislator based on the whole roll-call career of a legislator. Position, for each congress measures the rank of each legislator in the distribution of ideologies. Nominate - NS, measures the nominate score for each congress for all votes excluded those on slavery. This last score is estimated using the W-Nominate algorithm. For all measures, higher scores imply an ideology more leaning to the Jacksonian/Democratic party. All measures are scaled between 0 and 100. All regressions include district and congress fixed effect, regional trends and trends varying with distance from the North. Regression from (5) to (8) also include party trends.

A.1.14 Newspapers

A.1.14.1 Coding examples

To establish the partisan position of a newspaper we rely on information form Chronicling America[69]. Here are two examples of the type of information provided by the Database.

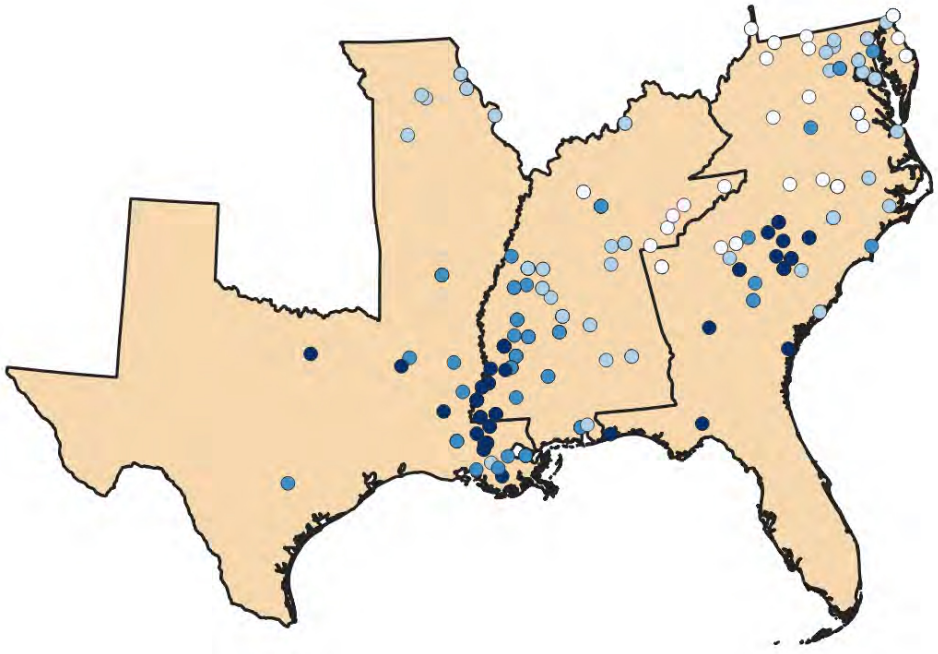
- "In November 1850, Thomas Palmer, editor/proprietor of the local Whig publication the Southron (1840-50) renamed it the Flag of the Union (1850-53)."

- "The Carrollton Democrat (1852?-1860?) reflected Southern sentiments on the eve of the Civil War: '. . . it is the duty of Congress to protect the slaveholder in the enjoyment of his rights, in the common territories.' Unsurprisingly, the paper supported the southern Democratic Party candidate for President, Kentuckian John C. Breckinridge."

[69] https://chroniclingamerica.loc.gov/. From the Library of Congress, Chronicling America: Historic American Newspapers site

A.1.14.2 Figures

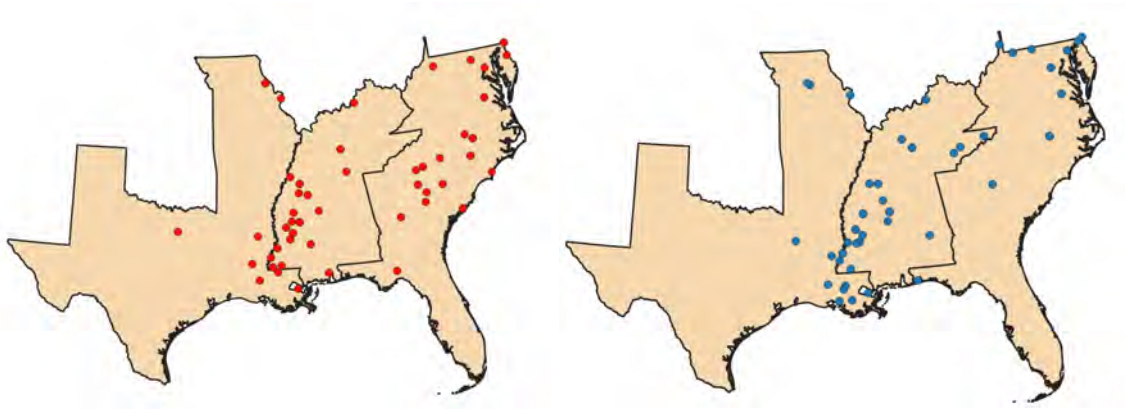
Figure A.12: Newspapers - Relative Productivity



This figure shows the location of all the 282 newspapers we use in our analysis and the 20Km circulation area. More than one newspaper can operating in the same location. The color indicates the average relative productivity of cotton with respect to wheat in the 20Km circulation area. Colors are divided in quartiles and a darker color represent a higher relative productivity.

Figure A.13: Newspapers

(a) Pro-slavery Newspapers (b) Not Pro-slavery Newspapers



Panel (b) shows the circulation area of all pro-slavery newspapers. Panel (c) shows the circulation area of all other partisan newspapers.

A.1.14.3 Circulation of 50Km

Table A.24: Newspapers - 50Km

	All Slavery Related Words	Abolition Emancipation	Fugitive Runaway	Slave Slavery
Pro-slavery	-0.818***	-1.129***	-0.710***	-0.386*
	(0.262)	(0.303)	(0.225)	(0.205)
Other Affiliation	1.866***	1.920***	1.348***	1.821***
	(0.384)	(0.342)	(0.329)	(0.379)
Observations	1505	1505	1505	1505
Year FE	Yes	Yes	Yes	Yes
Newspaper FE	Yes	Yes	Yes	Yes
Affiliation * Year	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes

Note: This table shows the marginal effect of land-rank in a 50Km radius on the supply of slavery related content. For each column the first estimated parameter shows the effects for pro-slavery newspapers. The second estimated parameters shows the effect on the other partisan newspapers. All estimates are based on the estimation of equation (2). The dependent variable is natural logarithm of the average number of times an issue mentions slave-related words. All regression control for Newspaper fixed effects, $\mathbb{1}\{\text{Pro-Slavery}\} *$ Year FE, $\mathbb{1}\{\text{Other Affiliation}\} *$ Year FE, Distance to the North $*$ Year FE and Census Region $*$ Year FE. Standard errors are clustered at the newspaper level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A.1.14.4 Placebo Words

Table A.25: Newspapers - Placebo Words

	Work	Tax	Price	Bibl*	Dollar
Pro-slavery	0.041	-0.367	-0.252	0.065	-0.353
	(0.330)	(0.422)	(0.496)	(0.330)	(0.466)
Other Affiliation	-0.312	-0.164	-0.430	-0.257	0.025
	(0.308)	(0.832)	(0.274)	(0.558)	(0.352)
Observations	1505	1505	1505	1505	1505
Year FE	Yes	Yes	Yes	Yes	Yes
Newspaper FE	Yes	Yes	Yes	Yes	Yes
Affiliation * Year	Yes	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes	Yes

Note: This table shows the marginal effect of land-rank in a 20Km radius on the supply of non-slavery related content. For each column the first estimated parameter shows the effects for pro-slavery newspapers. The second estimated parameters shows the effect on the other partisan newspapers. The dependent variable is natural logarithm of the average number of times an issue mentions slave-related words. All regression control for Newspaper fixed effects, $\mathbb{1}\{\text{Pro-Slavery}\}*$ Year FE, $\mathbb{1}\{\text{Other Affiliation}\}*$ Year FE, Distance to the North $*$ Year FE and Census Region $*$ Year FE. Standard errors are clustered at the newspaper level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A.1.14.5 Robustness

Table A.26: Newspapers - Probability

	All Slavery Related Words	Abolition Emancipation	Fugitive Runaway	Slave Slavery
Pro-slavery	-0.275**	-0.144**	-0.053*	-0.078
	(0.138)	(0.066)	(0.028)	(0.103)
Other Affiliation	0.765***	0.118***	0.051**	0.596***
	(0.183)	(0.041)	(0.023)	(0.134)
Observations	1505	1505	1505	1505
Year FE	Yes	Yes	Yes	Yes
Newspaper FE	Yes	Yes	Yes	Yes
Affiliation * Year	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes

Note: This table shows the marginal effect of land-rank in a 20Km radius on the supply of slavery-related content. For each column the first estimated parameter shows the effects for pro-slavery newspapers. The second estimated parameters shows the effect on the other partisan newspapers. The dependent variable is the share of words that are slavery-related (per 1000 words). All regression control for Newspaper fixed effects, $\mathbb{1}\{\text{Pro-Slavery}\}*$ Year FE, $\mathbb{1}\{\text{Other Affiliation}\}*$ Year FE, Distance to the North $*$ Year FE and Census Region $*$ Year FE. Standard errors are clustered at the newspaper level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A.1.14.6 Newspaper Content

Table A.27: Newspapers Words Counts

United State	New York	Van Buren	Southern State
$(8,735)$	$(6,063)$	$(2,618)$	$(2,222)$
Democratic Party	Free State	Anti Slavery	Slave State
$(2,145)$	$(2,113)$	$(2,101)$	$(2,028)$
South Carolina	Fugitive Slave	Slave Trade	North Carolina
$(1,969)$	$(1,836)$	$(1,713)$	$(1,629)$
Abolition Slavery	Whig Party	District Columbia	Slave Law
$(1,465)$	$(1,392)$	$(1,387)$	$(1,239)$
State Union	North South	Know Nothing	Wilmot Proviso
$(1,205)$	$(1,195)$	$(1,158)$	$(1,128)$

Note: The table lists the 20 most frequent bigrams among the articles mentioning 'abolition' and 'slavery' (both stemmed) at least once. The most frequent bigram is "United States". Frequency in parenthesis. *Sources:* Gale and Chronicling America.

A.1.14.7 A model of Newspaper' ideology

This section describes how we adapt Gentzkow and Shapiro, 2010 framework to model the effects of changes in local ideology to the supply of slave related issues by newspapers.

Each location l contains a continuum of households indexed by i. A set of newspapers N_l is available in each location and each household i must choose a subset of newspapers to buy $N_{il} \subseteq N_l$.

In our model newspapers have a fixed ideological position on slavery α_{nl}. In order to be in line with the empirical analysis there are two types of partisan newspapers. Those affiliated with a pro-slavery party (for example a Democratic party) with a pro-slavery position. We normalize α_{nl} for this newspapers to be equal to 1. On the other side of the ideological spectrum are partisan newspapers that are not pro-slavery (for example affiliated to the Whig party). We normalize α_{nl} for this newspapers to be equal to -1. While partisan newspapers cannot move their ideological position they can decide how much to write about the topic of slavery (N_{nl}^{Slave}). The interaction between their ideological position and amount of slavery related content is what we call the supply of pro-slavery content ($y_n \equiv N_{nl}^{Slave}\alpha_{nl}$). This value can be negative meaning that this newspaper supplies a lot of anti-slavery content.

On the consumer side, the utility that household i that lives in location l derives from reading newspaper n is u_{iln}. Therefore the overall utility for household i is the $\sum_{n \in N_{il}} u_{iln}$. u_{iln} depends on three factors: 1) an exogenous utility from reading newspaper n for all readers in location l ($\bar{u}_{ln}$) 2) a household-specific taste shock which follows a logistic distribution (ϵ_{iln}) 3) a distaste for reading a newspaper that deviates from the preferred supply of pro-slavery content. This is common to all readers in location l

The preferred supply of pro-slavery related content of each location ($ideal_l$) depends on location l ideological position on slavery (r_l). Higher values of r_l correspond to a more pro-slavery position. Locations with a high value of r_l would like to read a lot of pro-slavery related content (high and positive $ideal_l$). On the other side of the ideological spectrum are locations with a low r_l that would like to read a lot of anti-slavery content (high and negative $ideal_l$). Locations with a moderate ideological position for slavery do not particularly care for slave related content ($ideal_l$ close to zero). Formally:

$$u_{iln} = \bar{u}_{ln} - \gamma(y_n - \text{ideal}_l)^2 + \epsilon_{iln}$$

Gentzkow and Shapiro, 2010 shows that in equilibrium $\partial y_n / \partial r_l > 0$. In our model this translate to the following equilibrium behavior:

$$\begin{cases} \frac{\partial N_n^{Slave}}{\partial r_l} > 0 & \text{if} \quad \alpha_n = 1 \\ \\ \frac{\partial N_n^{Slave}}{\partial r_l} < 0 & \text{if} \quad \alpha_n = -1 \end{cases}$$

We should therefore expect that if places that lost comparative advantage in the use of slave labor experienced also an ideological shift towards a more anti-slavery position (lower r_l) this places should also experience a change in the supply of slave related content by local newspapers. In particular, pro-slavery newspapers should decrease the supply of slave related content while the other affiliated newspapers should increase the supply of this type of content. That is the observation we test in the main manuscript.

A.1.15 Potential Mechanisms

To better understand changes in the composition of the population, we look at changes in the distribution of slave-owning households by age and gender using household-level data. Below we report the estimates for both the age and gender structure and for the changes in the slave-holders' distribution.

Using the information on households available between 1810 and 1840, table A.28 quantifies the changes in the number of households owning slaves. Estimates show large changes in the share of slave-owning households (10 pp.)

as a response to changes in comparative advantage. The question is how much of this change is determined by the out-migration of slave-owning families to land better suited for the use of slave labor and how much is the result of slave-owning families selling their slaves.

To assess the relative importance of migration patterns in determining slave relocation, we study age and gender structure at the county level. First, table A.33 shows that a change in the comparative advantage induces an asymmetry in the age and gender structure. Places losing comparative advantage for cotton have a higher share of young population (between 20 and 29 years of age) and more males. These results seem to indicate that these counties were attracting more migrants. This is consistent with the view that slavery crowed out market opportunities for the landless and slave-less population. Second, in table A.34, we reproduce the same patterns but dividing between slave-owning and non-slave-owning households. The estimates are consistent with the previous one but do not show any difference in age and gender depending on slave-owning status. These results seem to rule out selection as the main driver of our main results.

A second approach to try to asses the contribution of migration to the observed changes is to estimate an upper-bound of the effect passing through migration, using the information in table A.32. Assuming that the loss in the number of slave-owning households is entirely due to migration and that each migrating household is in the top of the slave-ownership distribution, we can explain at most 70% of the decline in the number of slaves.[70] This implies that even in this extreme scenario, at least 30% of the movement of slaves is explained by market transaction.

Using the same idea, we can compare the change in the share of votes in favor of the Jakcsonian / Democratic party to the decline in the number of slave-holding households. We compare the change for the year 1830-1840.[71] Given that the average number of voters (white male above 19 years old)[72] per slave-holding family is 1.375 as opposed to 1.25 in non slave-holding household, a drop in the share of slave-holding families of 10.6 pp. should lead to a decrease of 11.7 pp. in the share of votes for the Jakcsonian / Democratic party. Table A.35 shows that the magnitudes of the effect between 1830 and 1840 are larger, indicating that migration can account for less than a third of the effect for the presidential election and one-fifth of the effect in the gubernatorial election.[73]

A second hypothesis is that the local planters controlled the political system through a paternalistic mix of coercion and private provision of public goods. Counties that lost economic interests became less attractive to planters also from a political point of view, therefore, reducing incentives to patronage.[74] Estimates in table A.31 show a very large effect of LR_{it} on the share of planters (households with at lest 50 slaves).[75] This view is consistent with our findings showing an increase in voters turnout[76] in counties that experienced a larger drop in planters. Table A.37 shows large differences in the share of votes cast as a share of the male adult population (up to 30 pp.) given a unit difference in LR_{it}.

To further investigate this hypothesis, we look at a proxy for the distribution of public goods. Although very limited and only available for the 1850 census, our estimates show that counties with higher relative productivity (RP_i) in 1850 had a higher level of schooling, literacy rates, and books in libraries.[78] These results are consistent

[70] The average slaveholding household within the top 164 in 1830 had 14 slaves. Table A.32 shows a decline in the slave-holding population of 164 families; thus migration would explain 72% of the change in the number of slaves, that is $(164 \times 14)/3188 = .72$.

[71] These are the only two decades for which we have both household-level data and significant differences across parties in their voting behavior on slavery.

[72] The age categories allow aggregation from 20 years old on, irrespectively on the actual voting age.

[73] $1.375/1.25 = .1$ so a drop of 10.6 pp in the share of slaveholding household leads to a drop in the share of votes of $10.6 \times 1.1 = 11.7$pp ca.

[74] The notion of paternalism has a long tradition in the scholarship on slavery. See for example Fox-Genovese (2005). The term has also been used to describe the labor relation in the postbellum agrarian South by Alston and Ferrie (1993).

[75] A drop of 2.6 pp. over a sample mean of .08 percent. An effect 3 times larger than the mean

[76] By the 1820s, only Virginia, and North Carolina imposed property qualifications[77] to access the ballot, while until 1832 and 1845, Mississippi and Louisiana respectively required voters to be taxpayers (Engerman and Sokoloff, 2005). Even so, the actual votes cast between 1828 and 1860 show a very large share of voters: on average, 70% of the adult (above 20 years of age) male population cast a ballot.

[78] Consistently, Clegg (2019), using newly digitalized census information for both 1850 and 1860, has shown that

with a view in which individuals in counties that are no more under the control of planters are less constrained in their political and social behavior.

A.1.15.1 Changes in the Slave-owning Population

Table A.28: Slave Households and Slave Ownership

	% of Slave HH	N Slave HH	Slaves per Slave Household			N. Planters
			Median HH	Top Quartile	Bottom Quartile	
Land-Rank	-0.279***	-149.6***	-1.184***	-3.794***	-0.517**	-18.20***
	(0.0422)	(54.10)	(0.399)	(0.833)	(0.215)	(2.239)
Observations	2128	2128	1921	1921	1921	2128
Mean	0.341	320.6	3.660	8.069	1.491	5.732
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes	Yes	Yes

Note: Dependent variables are the share of households owning at least one slave in a given census year between 1810 and 1840; the absolute number of households owning at least one slave and the absolute number of slaves, the number of slaves for different moment of the slave-household distribution, and the number of slaveholding planters (household with at least 50 slaves). The independent variable is Land-Rank$_{it}$ as described in the baseline. All regressions include county and year fixed effect, trends that vary with distance from the North (Mason-Dixon line), and Region trends. Robust Standard Errors clustered at the county level in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

wages were systematically higher in plantations counties with respect to the rest of the South, suggesting that patronage relationship implied better working conditions for the local white population.

Table A.29: Slave Households and Slave Ownership

	1 - 5 Slaves		5 - 10 Slaves	
	% Slave HH	% Total HH	% Slave HH	% Total HH
Land-Rank	0.0414**	-0.0624***	0.0468***	-0.0637***
	(0.0187)	(0.0200)	(0.0118)	(0.0106)
Observations	2100	2195	2100	2195
Mean	0.624	0.192	0.254	0.0883
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes

Note: Dependent variables are the number of households owning between 1 and 5 as a share of both the number of slave-owning households and the total number of households. Colum (3)-(4) reports the same for households owning between 5 and 10 slaves. The independent variable is Land-Rank$_{it}$ as described in the baseline. All regressions include county and year fixed effect, trends that vary with distance from the North (Mason-Dixon line), and Region trends. Robust Standard Errors clustered at the county level in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.30: Slave Households and Slave Ownership

	10 - 15 Slaves		15 - 20 Slaves	
	% Slave HH	% Total HH	% Slave HH	% Total HH
Land-Rank	-0.00940	-0.0442***	-0.0141***	-0.0316***
	(0.00822)	(0.00605)	(0.00540)	(0.00352)
Observations	2100	2195	2100	2195
Mean	0.104	0.0402	0.0496	0.0204
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes

Note: Dependent variables are the number of households owning between 10 and 15 as a share of both the number of slave-owning households and the total number of households. Colum (3)-(4) reports the same for households owning between 15 and 20 slaves. The independent variable is Land-Rank$_{it}$ as described in the baseline. All regressions include county and year fixed effect, trends that vary with distance from the North (Mason-Dixon line), and Region trends. Robust Standard Errors clustered at the county level in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.31: Slave Households and Slave Ownership

	20 - 30 Slaves		30 - 50 Slaves		+50 Slaves	
	% Slave HH	% Total HH	% Slave HH	% Total HH	% Slave HH	% Total HH
Land-Rank	-0.0160***	-0.0341***	-0.0275***	-0.0332***	-0.0216***	-0.0261***
	(0.00546)	(0.00335)	(0.00449)	(0.00280)	(0.00590)	(0.00296)
Observations	2100	2195	2100	2195	2100	2195
Mean	0.0394	0.0394	0.0238	0.0112	0.0155	0.00770
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes	Yes	Yes

Note: Dependent variables are the number of households owning between 20 and 30 as a share of both the number of slave-owning households and the total number of households. Colum (3)-(4) reports the same for households owning between 30 and 40 slaves. Colum (5)-(6) reports the same for households owning more than 50 slaves. The independent variable is Land-Rank$_{it}$ as described in the baseline. All regressions include county and year fixed effect, trends that vary with distance from the North (Mason-Dixon line), and Region trends. Robust Standard Errors clustered at the county level in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.32: Slave Household Distribution

	% of Slave HH	Mean N Slave HH	N Slaves	Slave HH
Land-Rank	-0.106***	-2.800***	-3188.1***	-164.2***
	(0.0327)	(0.989)	(540.5)	(50.11)
Observations	1214	1198	1214	1214
Mean	0.381	6.209	2911.9	353.0
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes

Note: The table shows the effect of Land-Rank$_{it}$ on the share of slave-holding household; the average number of slaves per slave-owning household, the number of slaves and the number of slave-holding households. Estimates are for the years from 1830 to 1840 for comparability with voting behavior. The sample means of the dependent variables are reported in the tables. Each regression includes county and year fixed effect, and trends in the distance from the North, and census regional trends. Robust Standard errors, clustered at the county level are in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A.1.15.2 Age and Gender

Table A.33: Age and Gender Distribution: Migration

	Share Male 20-29	Ratio Male - Female	Share Female 20-29	Ratio Male - Female 20-29
Land-Rank	0.0191***	0.0326***	-0.0000240	0.187***
	(0.00386)	(0.00905)	(0.00272)	(0.0287)
Observations	3474	4471	3474	3469
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes

Note: The table shows the effect of Land-Rank$_{it}$ on the number of white males between 20 and 29 years old over the total white male population; ratio of white males on white females; number of white females between 20 and 29 years old over the total white females population; and number of white males between 20 and 29 over white females between 20 and 29. Estimates are for the years from 1810 to 1860. Each regression includes county and year fixed effect, and trends in the distance from the North, and census regional trends. Robust Standard errors, clustered at the county level are in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.34: Age and Gender Distribution: Migration

	% Male 26-44 in SHH	% Male 26-44 in NSHH	Male 26-44 SHH	Male 26-44 NSHH
Land-Rank	0.0210***	0.0181***	0.0388***	0.0408***
	(0.00517)	(0.00381)	(0.00949)	(0.00866)
Observations	2100	2100	1986	1989
Difference	.	0.003	.	-0.002
S.E	.	0.006	.	0.013
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes

Note: The table shows the effect of Land-Rank$_{it}$ on the number of white males between 26 and 44 years old over the number of free household inhabitants and the number of white males between 26 and 44 years old per households across slave and non-slave-owning households. The table reports the differences and the standard errors of the difference between the estimates across slave and non-slave-owning households. Each regression includes county and year fixed effect, and trends in the distance from the North, and census regional trends. Robust Standard errors, clustered at the county level are in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A.1.15.3 Voting and Turnout

Table A.35: Voting Behavior 1830 - 1840

	Presidential Election	Gubernatorial Election
	% Democrats	% Democrats
Land-Rank	-0.364***	-0.580***
	(0.131)	(0.127)
Observations	1442	1307
County FE	Yes	Yes
Year FE	Yes	Yes
Region * Year	Yes	Yes
ln(Distance North) * Year	Yes	Yes

Note: The table shows the effect of changes in Land-Rank$_{it}$ on the share of votes received by the Jacksonian - Democratic party. The variable Jacksonian - Democratic is the share of the Jacksonian party up to 1836 and the Democratic party afterwards. Estimates are for the years from 1830 to 1840 for comparability with changes in the share of slave-owning households. All regressions include county and year fixed effect, trends that vary with distance from the North and regional trends. Standard Errors clustered at the region *year level are shown in parenthesis. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.36: Electoral Turnout: All States

	Gubernatorial		Presidential	
	Tournout Adult	Tournout	Tournout Adult	Tournout
Land-Rank	0.107	0.0649*	0.128*	0.0545*
	(0.0944)	(0.0385)	(0.0735)	(0.0300)
Observations	2350	2355	2840	2845
Mean	0.767	0.331	0.695	0.301
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes

Note: The table shows the effect of Land-Rank$_{it}$ on the number of votes cast in the presidential and gubernatorial election divided by the the number of white male and white male above 20 years of age. All regressions include county and year fixed effect, trends that vary with distance from the North (Mason-Dixon line), and Region trends. Robust Standard Errors clustered at the county level in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.37: Electoral Turnout: No Franchise Restriction

	Gubernatorial		Presidential	
	Tournout Adult	Tournout	Tournout Adult	Tournout
Land-Rank	0.296***	0.140***	0.304***	0.135***
	(0.111)	(0.0453)	(0.101)	(0.0412)
Observations	2032	2037	2235	2240
Mean	0.767	0.331	0.695	0.301
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes	Yes

Note: The table shows the effect of Land-Rank$_{it}$ on the number of votes cast in the presidential and gubernatorial election divided by the the number of white male and white male above 20 years of age. All regressions include county and year fixed effect, trends that vary with distance from the North (Mason-Dixon line), and Region trends. In this table we restrict the analysis to those states that did not have any franchise restriction, we therefore exclude Virginia, North Carolina, Louisiana, and Mississippi. Robust Standard Errors clustered at the county level in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A.1.15.4 Public Goods

Table A.38: Schooling and Literacy

	Educational Income	Public School Income	Books in libraries	%White Illiterate
RP	843.918***	395.495***	89.602*	-0.034***
	(177.44)	(96.29)	(50.13)	(0.01)
Observations	974	886	969	973
Mean Dep. Var.	786.006	486.983	67.399	0.091
State FE	Yes	Yes	Yes	Yes
Ln Distance from North	Yes	Yes	Yes	Yes
Sample	1850	1850	1850	1850

Note: The table shows the effect of Land-Rank$_{it}$ the per 1000 of inhabitant income spent in education, public schools; the number of books in libraries and the illiteracy share as reported for the year 1850 in Haines and ICPSR, 2010.Independent variable is PR$_i$. Robust Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A.1.15.5 Free Blacks: Additional Results

A.1.15.6 Controlling for Alternative Mechanisms

To better understand the relationship between land-rank and the changes in the free black population, we control for two potential mechanism that may drive the location of free blacks and is related with land-rank. In particular, we control for the fact that free black population tended to be increasing in places with a growing urban population and closer to a navigable river. Importantly these two factors may be related to changes in Land-rank. Estimates are shown in Table A.39. Results show that while these mechanism are related to the location of free blacks even after controlling for them changes in the comparative still affects the location of free blacks.

Table A.39: Free Blacks, Urban Population and Navigable Rivers

	% Free on Black	% Free on Total	ln(Free)
Land-Rank	0.0208***	0.00508***	0.337***
	(0.00604)	(0.00144)	(0.116)
Ln Urban Pop.	0.00386***	0.000789***	0.0739***
	(0.000553)	(0.000132)	(0.0106)
Ln Distance River	0.00241**	0.00143***	-0.0610***
	(0.00121)	(0.000288)	(0.0232)
Observations	4470	4471	4471
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Region * Year	Yes	Yes	Yes
ln(Distance North) * Year	Yes	Yes	Yes

Note: Ln Distance River is the log distance between each county centroid and the closest access to the US Network of navigable rivers. Ln Urban population represents the log of the urban population in the county. Urban areas are defined as above 2,500 people. All specification include county and year fixed effect, trends that vary with distance to the North=, and state trends. Robust Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

A.1.15.7 Migration and Fertility Rates

Changes in the free-black population could be caused by free blacks migrating into counties with higher land-rank. According to Berlin (1974), free blacks tended to remain in the counties where they were born because "immigration restrictions often stood in their ways[...]. Whites, unwilling to live near Free Negros and ever fearful of mobile free Negros revolutionaries, had early passed laws to restrict free negro movement [...]. Far more restrictive than regulations, the Free Negroes' precarious, often impoverished situations, anchor them to their homes and made them reluctant to emigrate. Ties of home and kin, the reputation with white customers or employers, their familiar routine, and their knowledge of the countryside often provided the only security poor free negroes had in a society that was hostile to their very existence."

The results could be also explained by changes in fertility (or death) rates. In order to test this explanation we compute the fertility rate across slave and free population using the available age categories. Table A.40 reports the results.

The dependent variable is computed as the ratio between the number of children in a given census year and the fertile females populations in the previous census. The age categories used to define fertile females vary across census year because of data availability. Fertile females are defined as those between 16 to 34 in 1810; 14 to 25 in 1820; 10 to

Table A.40: Fertility Rates

	Black Fertility	Slave Fertility
Land-Rank	-1.258	-0.072
	(1.03)	(0.36)
Observations	1178	1777
Mean Dep. Var.	3.950	3.735
County FE	Yes	Yes
Year FE	Yes	Yes
Region * Year	Yes	Yes
ln(Distance North) * Year	Yes	Yes

Note: This table shows the changes in fertility rates as determined by the expansion of the agricultural land for both the free black and the slave population. The dependent variable is computed as the ratio between the number of children in a given census year and the fertile females populations in the previous census. The age categories used to define fertile females are 16 to 34 in 1810; 14 to 25 in 1820; 10 to 23 in 1830; 10 to 23 in 1840; 10 to 19 in 1850. Children are defined as 0 to 13 in 1820 and form 0 to 9 in the rest of the years. Each regression includes county and year fixed effect, trends in distance from the North and Region trends. Robust Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

23 in 1830;10 to 23 in 1840; 10 to 19 in 1850. Children are defined as individuals from 0 to 13 in 1820 and form 0 to 9 in the rest of the Census years. Although this is a rough measure of fertility, the measurement error due to the age categories is constant across the entire sample and, therefore, does not constitute a concern for the exercise in Table A.40. The estimates in columns (1-2) show that free black fertility rates do not vary with land-rank.

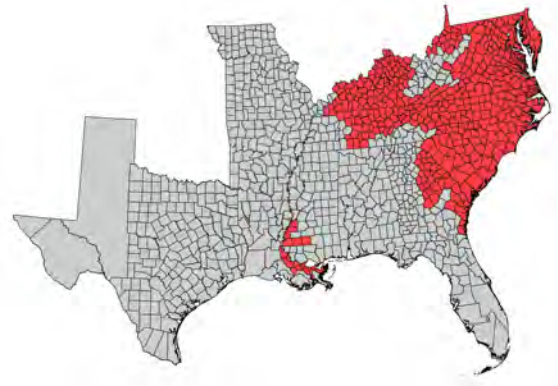
A.1.16 Figures - Westward Expansion, Slavery and Agriculture

Figure A.14: Slave States

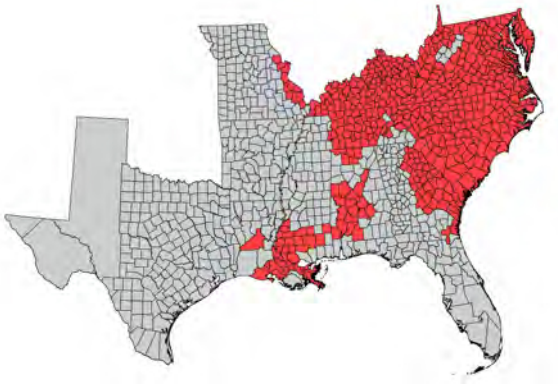
Note: The figure reports the counties belonging to a slave state which appear in at least two censuses between 1810 and 1860. These are: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, South Carolina, Tennessee, Texas, Virginia.

Figure A.15: Westward Expansion

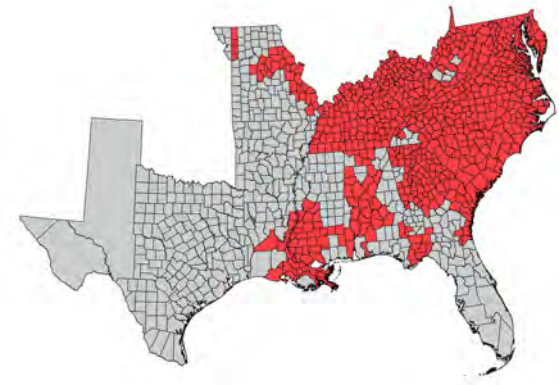
(a) 1810



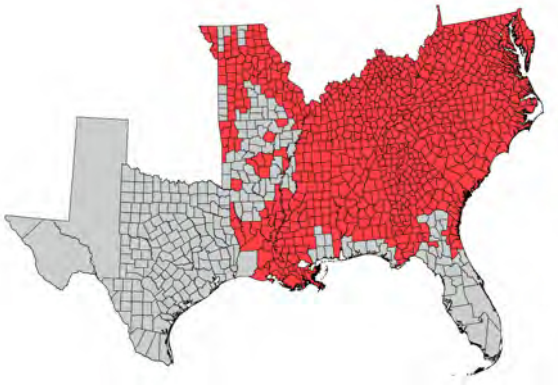
(b) 1820



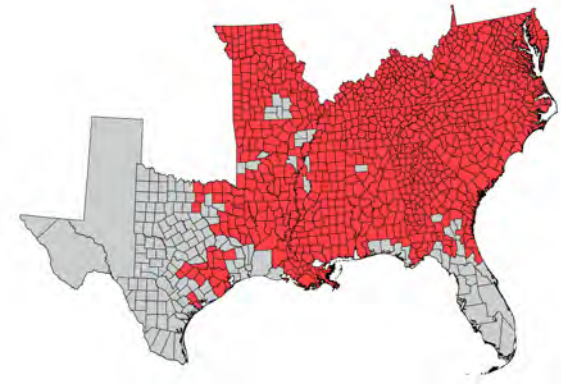
(c) 1830



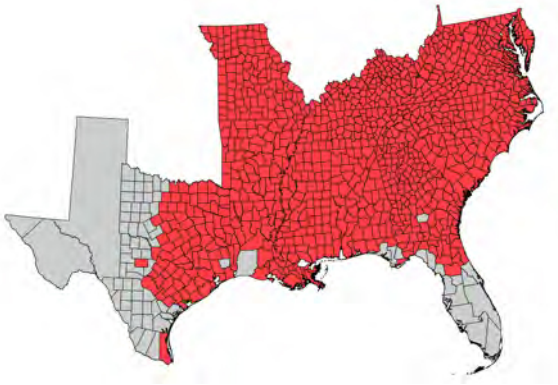
(d) 1840



(e) 1850



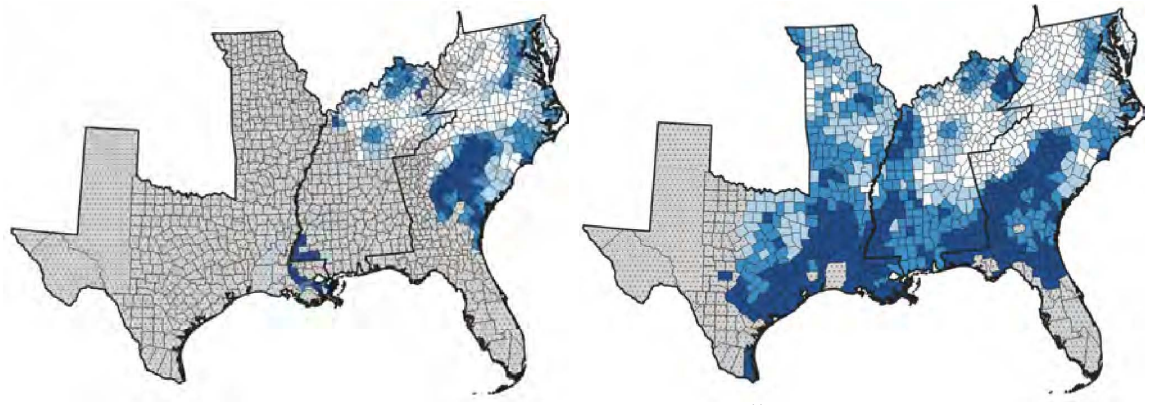
(f) 1860



Note: Red counties represents counties with a population density higher than 2 individuals per Km^2. Grey counties are counties belonging to the US Slaves State in 1860.

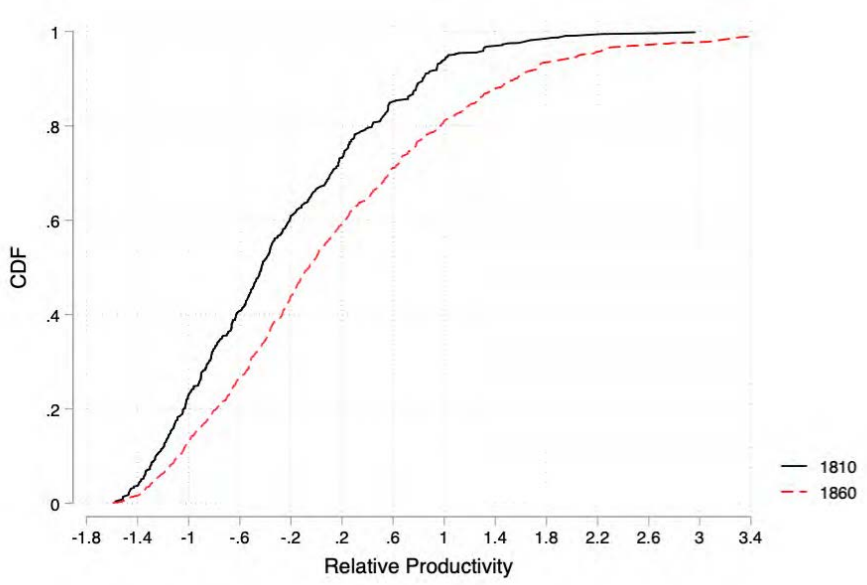
Figure A.16: Relative Productivity

(a) Relative Productivity in 1810 (b) Relative Productivity in 1860



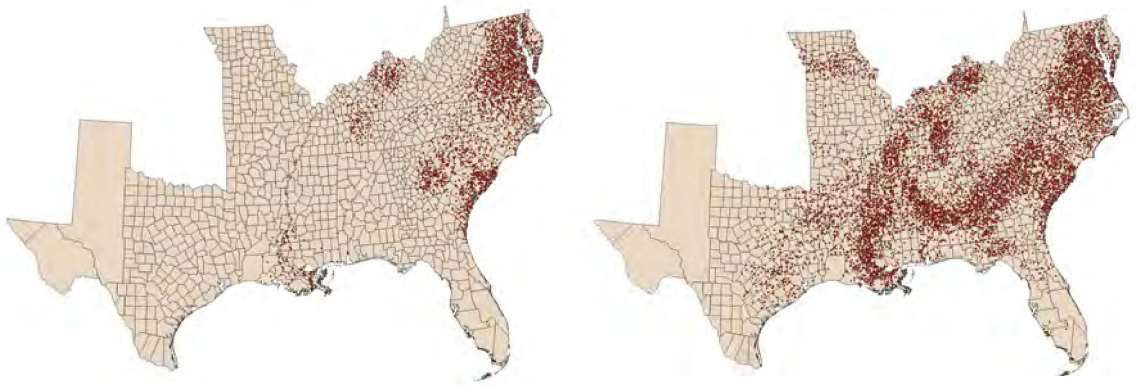
Panel (a) and (b) show the distribution of relative productivity, $A_i = \frac{A^{cotton}}{A^{wheat}}$. The darkest counties represent the top 25% of the distribution in 1860, the lightest the bottom 25% in 1860. Panel (a) shows in gray the counties with a population density lower than 2 individuals per km^2 in 1810. Panel (b) shows in gray the counties with a population density lower than 2 individuals per km^2 in 1810.

Figure A.17: Distribution of Relative Productivity



Note: The figure shows the shift in the distribution of relative productivity from 1810 to 1860.

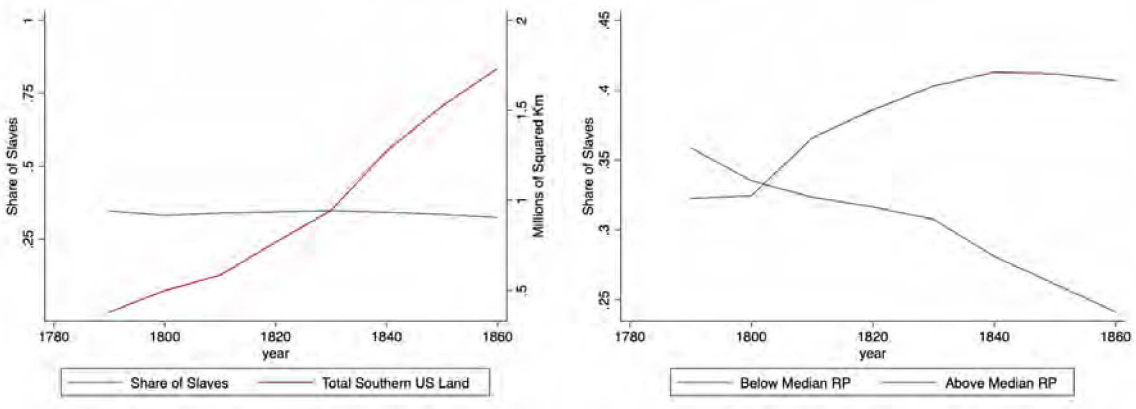
Figure A.18: Slave Relocation



(a) 1810 (b) 1860

Note: Panel (a) represents the distribution of slaves in 1810, panel (b) the distribution of slaves in 1860. Each dot corresponds to 500 slaves. The counties represented are those counties belonging to a Slave State in 1860.

Figure A.19: Share of Slaves and Land Expansion

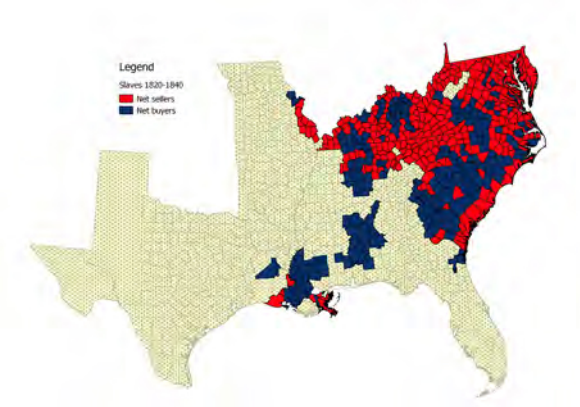


(a) Share of Slaves and Land (b) Share of Slaves by Relative Productivity

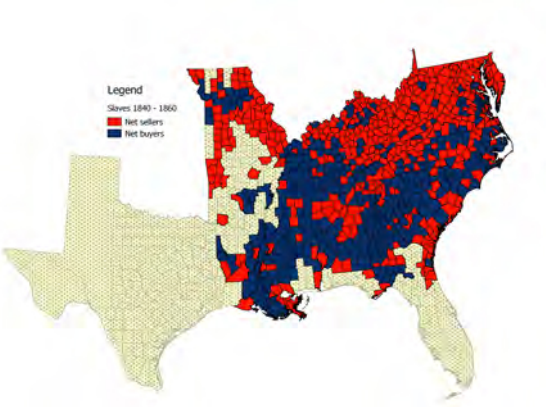
Note: Panel (a) represents the total number of slaves divided by total population and the total land inhabited over time. Panel (b) shows respectively the total number of slave over the total population in counties below and above median relative productivity with respect to the 1860 distribution.

Figure A.20: Agricultural Transformation and Slave Labor Adjustment

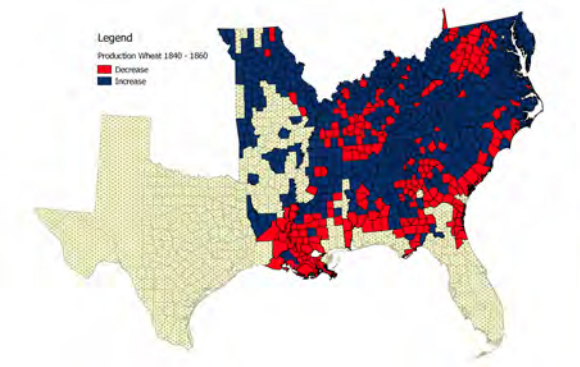
(a) Slave Labor 1820 - 1840



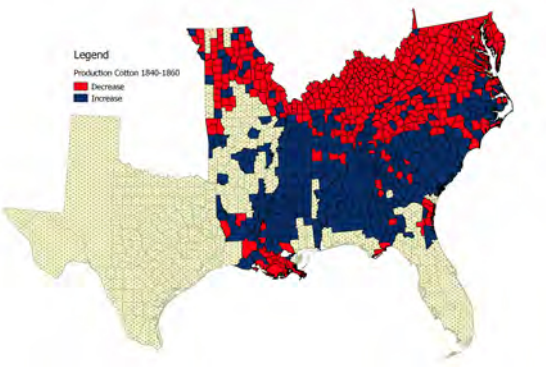
(b) Slave Labor 1840 - 1860



(c) Wheat Change 1840 - 1860



(d) Cotton Change 1840 - 1860



Changes in production and slave labor allocation. Panel (a) represents in redo counties which decreased the number of slaves between 1820 and 1840 in counties with population density higher than 2 in 1820. Changes are net of the slave population growth. Panel (b) represents the same for the period 1840-1860. Panel (c) and (d) show respectively the change in production of wheat and cotton between 1840-1860 in counties with population density higher than 2 in 1840. Red counties decreased production while blue counties increased.

2 Agricultural Modernization and Redistributive Conflict: The Struggle for Land in Brazil, with Stefano Falcone

2.1 Introduction

Theories of economic development identify in the process of modernization of the agricultural sector one key determinant of structural transformation. Increased agricultural productivity can induce rural workers to find employment in the industrial sector, stimulating investments in manufacture and inducing growth.[79] Although the increase in income generated by economic development is often associated with a decline in conflict, the economic forces that contribute to the process of development through agricultural modernization can unleash conflictual claims on previously uncontested assets (Ray and Esteban, 2017). Historical cases have shown explosions of violence associated with modernization, both in manufacture and agriculture (Mokyr, 1992; Caprettini and Voth, 2017); however, it is unclear how the recent process of development affects redistributive conflict.

In the decades between the 1990s and 2000s, several countries underwent a process of modernization of the agricultural sector that led to a high rise in productivity together with a decline in the employment share of agriculture.[80] This paper analyzes the role of agricultural sector modernization as a driver of conflict for the redistribution of productive assets: land. Whether the process of agricultural modernization should induce conflict is *a priori* unclear. Our setting allows us to establish a link between the increase in agricultural productivity and conflict over land, and investigate the channels that foster or mitigate this relationship.

We carry on the analysis in the context of Brazil, where, in the 1990s, trade liberalization shifted incentives from a model of import substitution manufacture to an export-oriented agricultural sector, pushing for large investments in the rural areas.[81] The Brazilian case is also particularly relevant because the country is the theater of an active political struggle for the agrarian reform. In a context where 45% of the land is concentrated in holdings than 1000 hectares,[82] conflict over land is endemic. Conflictual claims over land arise when rural poor occupy estates and claim rights on them. Land occupations can lead to either the forced expulsion of the occupiers or the acquisition of property rights. Between 1988 and 2014, CPT (2018) counted more than 9,000 cases of land occupations involving about 1,2 million families. During the early 1990s, Brazil implemented a large-scale trade liberalization that culminated in the Mercosur and saw the reduction of tariffs on manufacture and the elimination of taxes on primary export. In particular, in 1995-6 the Brazilian government implemented two key policies that incentivized large investments in the export-oriented agricultural sector: the removal of the Financial Operations Tax (IOF) on funds destined to agriculture and the exemption from the Tax on the Circulations of Goods and Services (ICMS) for primary and semi-elaborated goods destined to exports (Helfand and de Rezende, 2015). Together with the removal of tariffs on imported manufactured goods, these policies redirected investments from the protected manufacturing sectors to agriculture. This change in incentives affected municipalities differently depending on their local characteristics.

Our empirical strategy relies on the timing of the trade liberalization and on the exogeneity of the local potential gains from investment in agricultural modernization. We compute differential potential gains from the modernization of agriculture, exploiting soil, and weather characteristics of each municipality. To capture potential gains from modernization, we build on Bustos et al. (2016) and compute, for each municipality, the difference in the potential yield obtained under a regime of high and low inputs in agriculture.[83] Using the interaction between the period pre-

[79] There is a long-standing debate on the issue. For references see Lewis (1954); Kuznets (1973); Rosenstein-Rodan (1943); Mokyr (1976); Matsuyama (1992); Gollin et al. (2002); Bustos et al. (2016); Bustos et al. (2020)

[80] According to the ILO, Latin American countries increased added value per agricultural worker by 75% and decreased the employment share in agriculture by 30% (from 28% to 18%) between 1991 and 2019 (Organization, Data retrieved in September 2019).

[81] Resource reallocation across sectors as a consequence of opening the economy is consistent with Matsuyama (1992) for example.

[82] Accounting for 0.91% of the farms in 2006. See Figures B.30 and B.29 in Appendix.

[83] Regions non traditionally devoted to agriculture - for example, the Cerrado Region (mainly corresponding to the Central-West census region) - could not be cultivated without large and systematic investment in the chemicals and

and post-liberalization with the difference in potential yield under high and low regime, we capture the local changes in the return from agricultural modernization determined by trade liberalization. Moreover, we distinguish between two main crops. Soybean, the leading Brazilian export crop and highly capital intensive, and maize, one of the most labor-intensive crops produced in Brazil. Exploiting the differences between these two crops, our analysis sheds light on the different channels through which agricultural modernization affects conflict over land.

Our main findings show a sizable effect of the difference in potential yield in soybean production on land occupations starting from 1996. The effect is instead negative when we focus on the difference in potential yield of maize, the labor-intensive crop. We investigate several potential channels that could explain this effect. Our estimates show that the locations with higher potential gains from investment in soybean production are associated with a large expansion of the harvested land and a reduction in pasture land. This could reduce access to previously available assets for the local rural communities. Moreover, we document a decline in the number of workers per hectares employed in soybean production[84] and an associated increase in rural unemployment. These results are complemented by an increase in the average size of large farms[85] and a reduction in the share of land worked by small producers.[86] The picture is consistently reversed in the maize case, showing a strong counterbalancing effect in places with higher potential gains from investment in this crop. Finally, we show a large increase in quantity of land harvested with soybean (30 % higher each s.d.) and a more limited effect on the substitution between crops (the share of land in soybean increased by 8%). This result suggests that the expansion of the formal agricultural sector into previously not "enclosed" land as opposed to substitution between crops is one of the most important drivers of the results.

While in the first part of our empirical analysis, we investigate the economic determinants of land occupations, in the second part, we analyze two additional key aspects. First, we show evidence of a positive connection between political struggle and land redistribution; second, we investigate the role played by local potential leaders in enabling political action.[87] Although we cannot establish a causal relationship between land occupations and the transfer of land titles, our analysis suggests that land occupations, by increasing political pressure on the government agency in charge of the agrarian reform (INCRA), increase the probability for occupiers to obtain land titles. This result is in line with a political-economic tradition that sees the threat of political action as a determinant of wealth redistribution (Acemoglu and Robinson, 2000). To carry on the analysis, we divide settlements between those obtained as part of the agrarian reform (Redistributive Settlements) and settlements obtained under different programs (ex. environmental protection). The first type of settlements implies an actual transfer of titles from land-owners to occupiers and generally occur through the expropriation of contested land. The second tends to be located at the agricultural frontier, on public land not previously contested. Our results show that municipalities with a higher return from modernization in soy production experience a reduction in the number of settlements on non-contested areas after the liberalization. This result indicates an increase in the cost of redistribution in more profitable areas. The results are instead not significant in the case of redistributive settlement and settlement obtained through expropriation, suggesting a counterbalancing effect of political action. Moreover, we show in an event study setting, that the first occupation increased the probability of a settlement in the same municipality by more than 10 percentage points. This result appears not to be driven by municipalities registering an increasing probability of settlement leading to the first occupation. The estimated effect fades away after 16 years.

Our setting also allows us to study the role of constraints in determining collective actions. Land occupations are complex events that require the coordinated effort of a large number of people.[88] For these reasons, leadership and organization might be necessary. We study the role of the organizational capacity in conflict by studying how the presence of potential leaders at the local level affects land occupations. Because the probability of a successful

fertilizers (Márcio da Silva, 2018). Figure B.27 shows the evolution over time of the main soybean producing region.

[84] As shown by Bustos et al. (2016).

[85] Defined as farms above 1000 hectares.

[86] Less than 5 hectares of land.

[87] For works on land reform in both historical cases and developing countries see Besley and Burgess (2000), Bardhan and Mookherjee (2010), Galán (Submitted), and Caprettini et al. (2019).

[88] Occupations' size is variable, the largest events involved the participation of more than 5,000 families (CPT, 2018).

occupation is increasing in the number of participants, the classic strategic considerations are in place (Esteban and Ray, 2001). Coordination devices are needed to spread information about individuals' willingness to participate in land occupations. We focus on potential leaders as a specific coordination device. To do that we exploit the particular role played by the Brazilian Catholic Church in the fight for land redistribution. In the context of land reform in Brazil, the Catholic Church committed to the cause of the rural poor providing human and physical resources. As noted by Houtzager (2001), "progressive clergy and lay activists in Brazil were able to mobilize rural social groups (primarily small farmer and peasant groups) and local resources through the Church's impressive associational web, its own elaborate organizational structure, and a popular religious identity." Our findings suggest that economic incentives alone are not a sufficient condition for collective action to take place but require a minimum level of organizational capacity. We estimate that while no land occupation occurs in the absence of local priests when their number increases from the 50^{th} to the 75^{th} percentile, the number of occupying families doubles. These estimates are robust to a large number of alternative interactions, including several measures of inequality, land tenure arrangements and public spending. Finally, we show that when economic conditions are present, the presence of priests facilitates the success of collective action, increasing the probability of land redistribution.

2.1.1 Related Literature

There exists a large and established literature on the role of economic shocks on conflict. We advance on two key features. First, most of the literature focuses on transitory income shocks, such as weather or price shocks affecting agricultural output (Miguel et al., 2004; Miguel and Satyanath, 2011; Dube and Vargas, 2013; Bazzi and Blattman, 2014). Close to our context, Hidalgo et al. (2010) analyzes land occupations as determined by rainfall and droughts. Instead, we focus on one key aspect of the process of development, the modernization of the agricultural sector at the basis of structural transformation.[89] Even though it is known that historical episodes of violence outbreaks are associated with the adoption of labor-saving machines (Caprettini and Voth, 2017), little is known about the violence associated with the contemporary transition to a modern agricultural sector and its underlying causes. Our work highlights an unexplored mechanism through which economic development can induce political mobilization and unrest: the expansion of land cultivated in the formal agricultural sector. As of 2015, two-thirds of the developing world's 3 billion rural people were still devoted to subsistence agriculture, with weak property rights on land and a large informal economy (Rapsomanikis, 2015). As trade liberalization pushed for large investments in previously open land, local rural communities lost access to part of their resources. The loss of access to previously unclaimed land leads to land occupations as a means to ensure property titles on contested resources. Violence often arises as a result of land disputes on contestable land (Fetzer and Marden, 2017), with detrimental consequences on the security of tenure and the efficiency of agricultural production (Alston et al., 1999; Alston and Mueller, 2010).

Knowledge of the conflictual forces that arise in the process of structural transformation is relevant for its policy implications. A large literature has shown that optimal risk-coping mechanisms are a function of the type of risk poor households face, with a crucial distinction being drawn between idiosyncratic and common risks, and asset versus income risks (Dercon, 2002).[90].

Moreover, our analysis allows us to distinguish between several aspects of the determinants of conflict. Most empirical studies on conflict are in line with a theoretical framework in which positive shocks to capital intensive activities foster conflicts while positive shocks to labor-intensive activities reduce them (Dal Bó and Dal Bó, 2011; Dube and Vargas, 2013). However, this theory has been challenged by works suggesting no or even a negative relationship between unemployment and conflict (Berman et al., 2011). Our paper finds that consistently with the opportunity cost theory, a reduction in the available sources of income induced by the expansion of the capital-intensive sector increases the incidence of conflict over land. Higher potential gains from the labor-intensive sector

[89] See Bustos et al. (2016) for empirical evidence on the effect of agricultural modernization on structural transformation in the Brazilian context.

[90] Shocks to assets modify the allocation of households resources when adjusting to transitory events, affecting outcomes as diverse as child mortality (Rose, 1999), crop variety adoption (Morduch, 1990) and inequality (Rosenzweig and Binswanger, 1992

instead reduce land occupation. The size and magnitude of the two coefficients suggest that the effect is not mainly driven by an increase in the value of the prize, as often the case in the context of lootable resources (Berman et al., 2017).

This article also relates to the literature that analyzes the frictions that arise during economic transitions as trade liberalization and structural transformation. While prominent theories of international trade often focus on long-run equilibria where a reallocation of resources across economic activities happen without frictions, recent literature has shown strong persistence in local labor market outcomes, highlighting frictions in capital adjustment (Dix-Carneiro, 2014) and imperfect labor mobility (Dix-Carneiro and Kovak, 2017). The importance of these frictions has been highlighted for occupational choices (Banerjee and Newman (1993)), earnings and employment (Autor et al., 2014), crime (Dix-Carneiro et al., 2018) and political polarization (Autor et al., 2016). Our paper contributes to this literature by highlighting how social unrest can be a consequence of these frictions.

Finally, our results also relate to the literature on collective action. We show that organizational capacity, in the form of a preexisting network of potential leaders, implies the ability to overcome the coordination problems inherent in collective action. We find that the presence of potential leaders represents a necessary condition for collective political action even in the presence of individual incentives to mobilize. This result is part of the literature on the role of expectations and information technologies in protests and conflict. Enikolopov et al. (2016) presents evidence that the diffusion of an online social network increased protest turnout in Russia; Gonzalez (2016) provides evidence that peers' participation in Chilean student protests increased one's own; Hollenbach and Pierskalla (2013) and Manacorda and Tesei (2016) substantiate that mobile phones' diffusion fostered mass political mobilization in Africa. Cantoni et al. (2019) uses information on other individuals mobilization to disentangle the complementary and substitutes elements of the participation choice in the case of Hong Kong's anti-authoritarian movement. Finally, in line with Acemoglu and Jackson (2015), we contribute to the literature on social capital by highlighting the key role of leaders in conflict. Satyanath et al. (2017) studies the case of pre-Nazi Germany, showing that the density of the network of social clubs and associations facilitated the rise of Hitler. Madestam et al. (2013) finds evidence for a "social multiplier", with more people favoring a radical movement if they see support in large numbers, in the rise of the Tea Party in the United States.

The remainder of the paper is organized as follows. Section 2.2 describes the Brazilian context. Section 2.3 presents the data. Section 2.4 outlines the empirical strategy. Section 2.5 presents the main results. Section 2.6 analyzes the role of local leaders in increasing the incidence of collective action. Section 2.7 provides a set of robustness checks on our main results. Section 2.8 concludes.

2.2 Agriculture Expansion and Conflict over Land

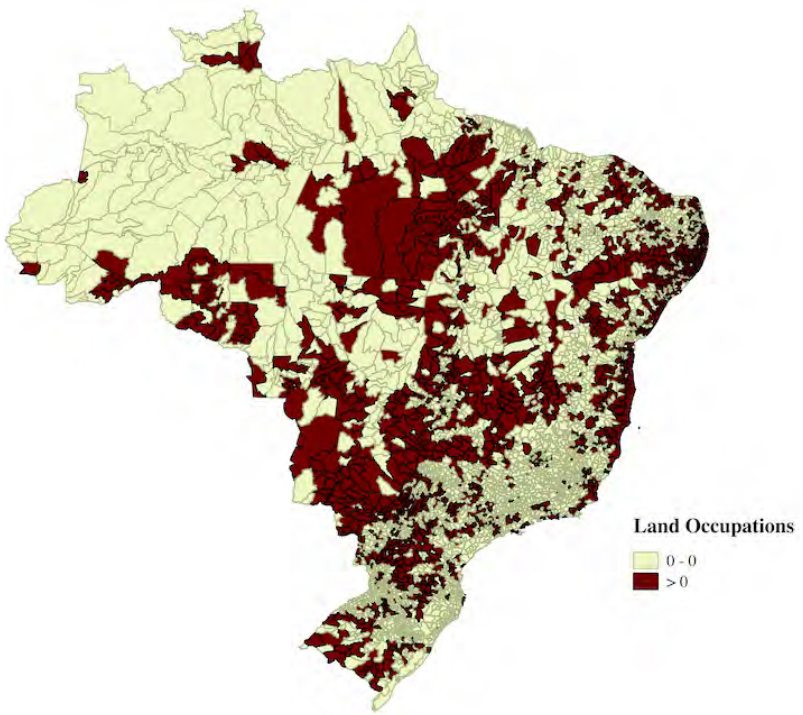
Brazil is characterized by one of the world's most unequal land distributions (FAO, 2010). During the colonial period, the Portuguese Crown divided Brazil in fifteen lots of land and offered them to twelve *captains*. The system of *captaincies* and *sesmarias*, abolished in 1821, left the country divided in *latifúndios* or large rural landholdings, leading to today's high concentration of land property (Fausto and Fausto, 2014): in 2006, landholdings over 1,000 hectares accounted for 0.91% of the total and concentrated 45% of the entire rural area, while landholdings less than 10 hectares represented 47% of the total, occupying less than 2.3% of the rural area (IBGE, 2006).

Despite several apparent attempts to promote land redistribution, all political coalitions failed both in the case of Getúlio Vargas (1930–1945) and of the military dictatorship (Ondetti, 2008). During the transition to democracy, the question of *reforma agrária* (land reform) returned to the political agenda: the new Constitution of October 1988 consecrated the "social function" of land, implying that unproductive private plots are susceptible to be expropriated by the government in exchange for a monetary compensation linked to the market value of the land. Since the democratic transition, no systematic process of land redistribution has been put in place. Contextually conflict over land access, known as land occupations, started to be carried out by landless peasant.

The explicit goal of the occupiers, in line with the principles expressed in the Constitution, is to obtain title to the land expropriated by the state from unproductive estates. (Morissawa, 2001). Since the late 1980s, the forcible occupation of land became a widespread political phenomenon and the core tactic of political movements pushing for

agrarian reform. The process of expropriation is carried out by the INCRA, the governmental agency in charge of the program of land redistribution. Occupations can result in recognized *settlements* or can turn into expulsion and lead to violent conflicts. The process behind a land grant is the result of the interlaid decisions of the INCRA and the judicial system. If the landowner appeals to the local court to obtain the restoration of possession, the occupiers usually squat in an encampment of improvised tents for the entire duration of the trial (Hammond, 2009). If local judges rule in favor of the occupiers, the INCRA negotiates a compensation with the landowner. However, local courts order the eviction of occupiers in more than 95% of the cases (Meszaros, 2000), sometimes resulting in violent clashes and deaths of militants and military forces (Fernandes, 1997). Evicted occupiers are occasionally resettled in state-owned territories or in plots of land already expropriated by the INCRA, generally at the agricultural frontier. Figure 21 shows the municipality where at least one occupation occurred between 1988 and 2014.

Figure 21: Land Occupations 1988-2014



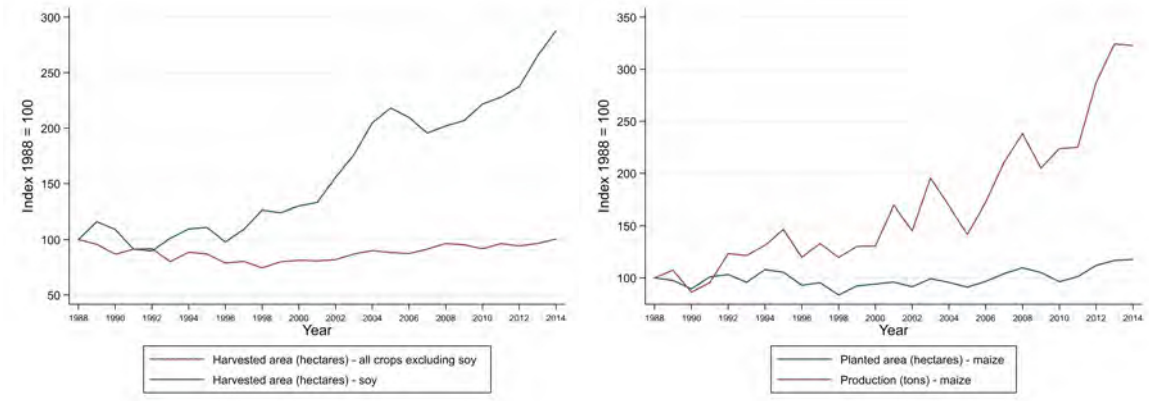
Notes: Municipality where at least one land occupation occurred between 1988 and 2014 are reported in color. *Data Source:* CPT (2018) and IBGE (2006).

2.2.1 Trade Liberalization and Agriculture Expansion

While until the late 1980s, the Brazilian economy was characterized by a heavy state presence and trade control meant to incentivize import-substituting industrialization, the early 1990s saw the reorientation of its policies toward trade liberalization. In 1987, the average tariff level across all sectors was 55 percent (Kovak, 2013b); by 1995, the measures of trade liberalization substantially reduced the imposition of tariffs. While high tariffs were imposed on manufacturing sectors, agriculture had virtually no tariffs prior to the liberalization, suggesting a comparative advantage in agricultural production. As highlighted by Matsuyama (1992), moving to an open economy incentivize

the reallocation of resources toward the sector that enjoys a comparative advantage. Moreover, the removal of trade barriers to the import of machinery and fertilizers further contributed to the reduction of production costs in agriculture. Together with the elimination of these trade barriers, the government also sought to incentivize exports by decreasing taxation and attracting foreign investments in the agricultural sector. The removal in 1995 of the Financial Operations Tax (IOF) concerning agricultural operations contributed to the attraction of foreign investments, and the exoneration of primary and semi-manufactured products from trade tax (Complementary Law N. 87 of September 1996, known as Kandir Law) implied a 13% decreased in the taxes on primary product designated to export (Helfand and de Rezende, 2015). These policies represented a substantial drop in the real cost of production and a discontinuous increase in the potential profits from the export crops. In this context, soybean affirmed itself as the leading export crop, strongly dominating trends in agricultural expansion and pushing the agricultural specialization of the Brazilian economy. Figure 21 panel (a) shows the pattern of harvested land in soy and other crops between 1988 and 2014. The figure highlights the national rise in the harvested area in soy since 1996, in sharp contrast with the area used for other crops.

Figure 22: Expansion of Soy and Maize Production



(a) Harvested are in Soy

(b) Harvested area and Maize Production

Notes: Panel (a) reports the trend in the harvested land in soy and other crops between 1988 and 2014. Panel (b) shows the area harvested in maize and its production between 1988 and 2014. All measures are normalized to 100 in 1988. *Data Source:* PAM

The expansion of the soybean harvested area took place both through the replacement of previously cultivated areas and the incorporation of new land into the formal agricultural sector. Because of the high level of the capital-intensity of the crop and the low number of agricultural workers per hectare, soybean expansion tends to be associated with a decrease in the number of employed rural workers. Between 1995 and 2006, the land harvested with soy passed from 9.2 to 17.9 million ha, while the number of workers per thousand hectares decreased from 28.6 to 17.1 (Bustos et al., 2016).

While the increase in soybean production happened through a large expansion in the amount of land harvested after 1995, technical change in maize production increased the crop yield with no increase in the cultivated area (see panel (a) Figure 22). In Brazil, maize used to be cultivated between August and December. However, starting from the late 1980s, a second harvesting season for maize started to be introduced between March and July. This second-harvest maize or *milho safrinha* (small-harvest maize) spread all over Brazil since the beginning of the 1990s.

Cultivation of small-harvest maize induced an increase in the yearly production per hectare, higher use of inputs together with an increase in the labor demand. Unlike soybean production, maize cultivation is one of the most labor-intensive crops cultivated in Brazil (Bustos et al., 2016).

The agricultural sector's expansion of the 1990s had different implications depending on the characteristics of the cultivated crops. The significant increase in the land devoted to soy reduced the amount of available unharvested land accessible to local rural communities, precipitating a "land rush" that has been associated with violence and conflict.[91] In particular, the expansion from the Southern to the Central West region, largely excluded from the formal agricultural sector before the 1990s, could have led to clashes between firms seeking the acquisition of land suitable for soybean cultivation and rural communities informally relying on those land.

On the one hand, the increased importance of the formal agricultural sector, by reducing the local landless ability to access open land, could increase the value of property rights regulation and push for actions aimed at triggering land redistribution in the form of settlement concessions. On the other, the increased importance of the sector could increase incentives for occupations by increasing the value of the prize. Exploiting the variation in the composition of capital, labor, and land across soybean and maize production, we investigate the potential channels through which agricultural modernization can affect land occupations in Brazil.

2.3 Data and Summary Statistics

This section provides information on the data on land occupations and settlements, difference in soy potential yields, and socioeconomic characteristics at the municipal level.

2.3.1 Land Occupations and Redistribution

Information on the number of land occupations and the involved occupying families is provided by Dataluta, which collects data on land occupations from various sources. The prevalent source is the Pastoral Commission on Land (*Comissão Pastoral da Terra*, CPT), an organization within the National Conference of Bishops of Brazil (*Conferência Nacional dos Bispos do Brasil*, CNBB). The CPT (2018) defines families as in IBGE (2010) and land occupations as "collective actions of landless families who, through entry into rural properties, claim land that does not fulfill the social function" (p.19, authors' translation).[92] The CPT obtains data through primary and secondary sources: the former is directly provided by agents of regional CPT offices or contained in official documents of social movements, churches, unions and other organizations linked to land conflict; the latter are collected in newspapers, political parties and governmental organizations (CPT, 2018).[93]

We use a binary measure of the outcome to circumvent potential measurement errors, although all results are confirmed when using the number of land occupations, as shown in Table B.50 in the Appendix. To avoid possible underreporting in municipalities in isolated zones or with low occupation activity, we show in Table B.51 that results are similar when restricting the analysis to municipalities with no land occupations before 1996. Additionally, although there might be a journalistic bias favoring the overstatement of the size of occupations, we show in Table 1 that our results are similar when using the number of occupying families or the dichotomous land occupations variable.

Dataluta also provides data on rural settlements or *assentamentos*, collecting information published by the governmental agency INCRA on independent agricultural units installed in previously owned land. Dataluta provides information on the municipality of each rural *assentamento*, the date of its creation, the settlement area in hectares, the number of settled families, its form of grant (expropriation or others) and type (federal, state or municipal). We

[91] Anecdotal evidence on the relationship between soybean expansion and conflict is frequent. For example, (Turzi, 2016, p.95) documents that, "from 2003 to 2014 there were 390 Indians killed in Mato Grosso do Sul, mostly Kaiowa Guarani, fundamentally in conflict with ranchers and soybean plantations."

[92] "Family is the set of persons linked by relatives' ties, domestic dependence or norms of cohabitation, living in the same home unit, or a single person who lives alone in one home unit" (IBGE, 2010, authors' translation).

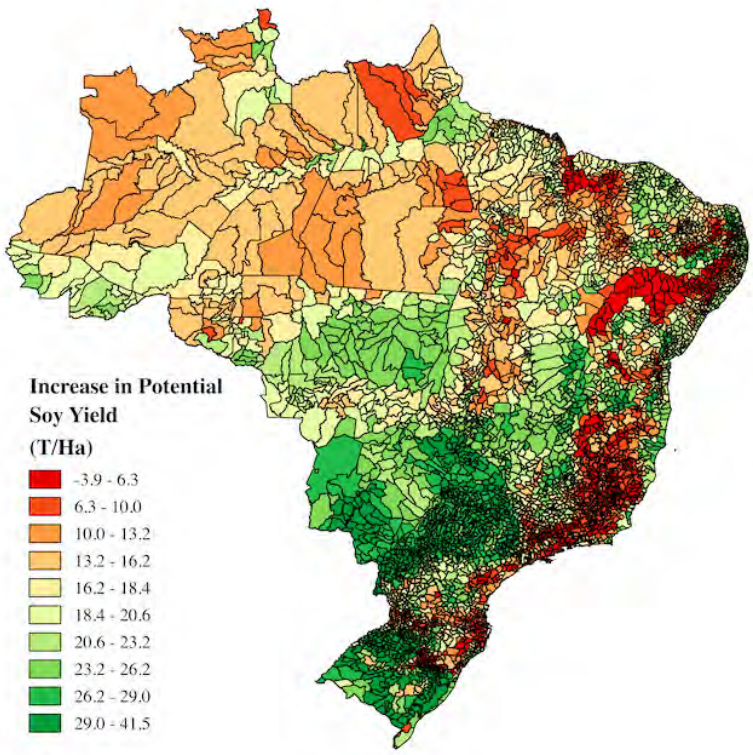
[93] If the numbers provided by the secondary sources do not coincide with those calculated by regional CPT offices, then the data from the primary source is registered. Also, in the case of a property occupied more than once in a given year, the CPT records one invasion and the highest number of families.

follow Rocha (2009) to code settlements that are part of the Agrarian Reform and actually change the property of the land (Redistributive Settlements) and settlements established outside the reform that do not affect the land tenure structure.

2.3.2 Difference in Soy Potential Yields

Data on potential yields in the production of soy is provided by FAO-GAEZ. We use potential yields measured as total production capacity in tons per hectare in rain-fed beans. Potential yields are estimated as a function of soil and weather characteristics at the grid level and an assumed quality of inputs: under the low-quality scenario, the model assumes traditional management practices, a subsistence-based farming system, traditional cultivars, labour-intensive techniques, no application of nutrients nor chemicals and minimum conservation measures; the high-quality scenario assumes advanced management practices, a market-oriented farming system, improved cultivars, full mechanization and optimal use of nutrients and chemicals. To construct our measure of difference in soy potential yields, we first aggregate data on soy potential yields under high-quality inputs from the grid to the municipal level and extract the mean. We then repeat this procedure for data on soy potential yields under low-quality inputs. The difference between soy potential yields under high- and low-quality inputs is our measure of the difference in soy potential yields. A map of the difference in soy potential yield is in Figure 23. We follow an identical procedure to measure the difference in maize potential yields, represented in Figure B.26 in the Appendix.

Figure 23: Difference in Soy Potential Yields



2.3.3 Socioeconomic Characteristics

Data on socioeconomic and demographic characteristics of municipalities are provided by various sources. GDP per capita, density of the population, share of rural population, income Gini, literacy, top 10% and bottom 50% landowners' share are published in the 1991 national census of the IBGE. The share of population in extreme poverty is the mean value of the 1991 and 2000 IBGE national censuses. The number of banks is the mean value of the 1991 and 2000 IBGE national censuses, and the 1995/96 Agricultural Census. Yearly data on planted area and crop production are provided by the Municipal Agriculture Production database (*Producão Agrícola Municipal*, PAM) of IBGE. As in Hidalgo et al. (2010), we measure agricultural income as a revenue-weighted sum of the log crop yields (tons per hectare) of the eight most important crops in Brazil: beans, coffee, corn, cotton, rice, soy, sugar, and wheat. In the calculation of the crop revenue at the municipal level, national and international prices are assumed to be given. We create a variable measuring the average pre-treatment agricultural income by calculating the mean over 1991-1995. Land Gini measures the average distribution of land in 1992 and 1998 as calculated by Hoffmann (1998), based on INCRA (2019)'s data.

Table 41: Summary Statistics

Sample: 1988 - 2014	*N*	Mean	SD
Land Occupations, Dichotomous	152,447	0.034	0.181
Land Occupations, Count	150,417	0.062	0.470
Occupying Families	150,222	8.478	91.254
Families per Land Occupation	4,981	148.63	212.91
Settlements, Dichotomous	152,447	0.037	0.190
Settlements, Count	152,447	0.060	0.823
Settlements, Redistributive	152,475	0.036	0.187
Settlements, Non-Redistributive	152,475	.0058	.0757
Area per Settlement (Hectares)	5,706	10,018	71,336
Area of Settlements (Hectares)	152,447	374.97	13,930
Families per Settlement	5,715	153.18	342.11
Families in Settlements	152,447	5.742	72.343
Settlements by Expropriation (Proportion)	5,715	0.661	0.462
Planted Area (Hectares)	140,511	11,173	25,930
Soy Planted Area (Hectares)	42,655	10,778	27,765
Soy Planted Area (Proportion)	42,653	30.118	24.868
Rural Unemployment (1991 and 2000)	9,108	0.049	0.054
Sample: 1991	***N***	**Mean**	**SD**
Change in Soy Potential Yields (Model 1960 - 1990)	150,093	1,814	853
Change in Maize Potential Yields (Model 1960 - 1990)	150,093	3,106	1,843
Priests per Catholic (1960)	78,111	1.585	5.700
Adult Rural Population	119,745	0.469	0.228
Log GDP per capita	97,119	4.517	0.588
Log Population Density	121,257	13.316	1.348
Literacy (Proportion)	121,257	0.580	0.164
Land Gini (Mean, 1992 and 1998)	121,712	0.739	0.139
Landless Population (Proportion, 1995)	121,791	0.289	0.208

Note: Variables under Sample: 1988 - 2014 are observed every year, with the exception of Rural Unemployment (in 1991 and 2000). Variables under Sample: 1991 are observed only in 1991, with the exception of Priests per Catholic (in 1960), Land Gini (the mean of 1992 and 1998 as in Hoffmann, 1998), Landless (1995/96 IBGE Agricultural Census) and changes in potential yields (measured as in the FAO-GAEZ model using soil and weather characteristics in the 1960 - 1990 period).

As in Hidalgo et al. (2010), this measure is adjusted with the share of the landless population and we follow Esteban et al. (2005) to derive land polarization from land inequality.[94] Data on the share of landless and land with fixed-rent, ownership and sharecropping tenures, and on the share of unused arable land is administered by the 1995/96 IBGE Agricultural Census. Information on municipal budget for social spending and security budget is provided yearly since 1991 by the Institute of Applied Economic Research (*Instituto de Pesquisa Econômica Aplicada*, IPEA), a government-led research organization. Data on rural unemployment is provided by the 1991 and 2000 IBGE national censuses while the number of workers per hectare is available in the 1995/96 and 2006 IBGE Agricultural Censuses. The Catholic Census of Brazil compiled by the Centre for Religious Studies and Social Research (*Centro*

[94]Land polarization is calculated by $\sum_i \sum_j \pi_i^{(1+\alpha)} \pi_j |\mu_i - \mu_j|$, where i and j are two groups, π is the fraction of landowners in each group and μ is the share of land owned by landowners in each group. As in Hidalgo et al. (2010), we let $\alpha = 0.5$.

de Estudos Religiosos e Investigações Sociais, CERIS) provides data for the number of Catholic priests and Catholic population in 1966 and 1975. We capture the presence of priests in 1966 and 1975, using the number of priests per 1,000 of Catholics in 1966. Table 41 reports summary statistics for the set of municipal-level variables used in our baseline regressions for the period 1988-2014. Table B.48 in the Appendix shows summary statistics on the complete set of variables used in our study.

2.4 Empirical Framework

Our analysis is conducted on a panel of Brazilian municipalities (*munícipios*) from 1988 to 2014. We estimate the effect of soybean expansion on land occupations exploiting the increase in incentives to the production of export-oriented crops since the trade liberalization of the year 1995-1996. First, we exploit the timing of trade liberalization. We use the years 1995-1996 as a reference because the two critical legislative changes that fostered capital investment in the agricultural sector were adopted in 1995 and 1996. The removal of the Financial Operations Tax (IOF) in 1995 exclusively on funds destined to the agricultural sector decreased the cost of financial operations; while in 1996 the Kandir Law exempted agricultural exports from the Tax on the Circulations of Goods and Services (ICMS), reducing costs by 13% (Helfand and de Rezende, 2015). Although the date of trade liberalization is related to the Brazilian economic cycles, this major policy choice is arguably not the result of land occupations. Second, we rely on differences across municipalities in the potential gains derived from investment in the soybean sector. Investment in soybean cultivation has a higher return depending on the level of local productivity, which differs across municipality depending on the local soil and weather characteristics. To better capture differential changes in incentives since the liberalization period, we compute a measure of changes in profitability before and after 1995-1996 using potential gains from investments in high-input level techniques in the production of soybean. This measure has to be interpreted as local changes in potential gains from investment in soy production across the pre and post-liberalization period. We construct this measure using data from the FAO-GAEZ database. The FAO provides estimates for potential yields under both low and high levels of input. Low inputs are associated with labor-intensive techniques and no application of nutrients nor chemicals. Under the high level of inputs, production is based on improved varieties, low labor intensity, and optimal application of chemical pest disease and weed controls.[95] Differences in potential yield under the two input regimes is, therefore, a good measure of differences in potential gains from the adoption of capital intensive cultivation techniques. This measure has been used in Bustos et al. (2016) to study differential gains from the adoption of GE modified seeds.

Our empirical strategy relies on two identifying assumptions. First, we require parallel trends since liberalization in absence of the treatment. The assumption seems plausible given the absence of different trends in land occupations across municipalities with high and low levels of differential potential yields in soy production before the liberalization period (1995-1996), see Figure 24. The figure represents the estimated effect of ΔSoy on the incidence of land occupation each year from 1988 to 2014 from equation 5, taking 1995 as a reference year plotting $\hat{\beta}_t$ estimated from equation 5. Where y_{it} takes value one if in year t and municipality experience at least one land occupations, zero otherwise. γ_i is a set of municipality fixed-effect that capture time-invariant local characteristics, and δ_t is a set of either year fixed effects or state-by-year fixed effects which captures time-varying federal or state changes, such as aggregate political and economic changes.

$$y_{it} = \gamma_i + \delta_t + \sum_{t=1988, t\neq 1995}^{2014} \beta_t \mathbb{1}_{\text{Year = t}} \ \Delta\text{Soy}_i + \nu_{it} \tag{5}$$

Second, we need to exclude unobservables variables affecting differently municipalities with high and low differential potential yields in soy production, starting from 1996, which could explain different patterns in land occupations not passing through changes in agricultural production. Although we cannot directly test for this assumption, we can provide suggestive evidence against omitted variable bias. We include as a control a measure of potential gains from the introduction of the second harvest in maize cultivation. During the 1990s, a new technique for the cultivation

[95] See GAEZ Model Documentation for further reference.

of maize has been introduced in Brazil: small-harvest maize. The cultivation of the small-harvest maize allowed to increase production without increasing the acres of land used. Moreover, the cultivation techniques associated with the second harvest in maize cultivation increased labor demand (see Bustos et al. (2016)). Relying on variation coming from potential gains from soybean production (capital and land-intensive) and maize production (labor-intensive), we can disentangle the effect of the introduction of a higher level of input per se, as opposed to the effect of land expansion and changes in the composition between labor and capital. We compute potential gains from the introduction of small-harvest maize (ΔMaize) following the same methodology described in the case of ΔSoy.

A final potential concern with our identification strategy is that the soil and weather characteristics driving the variation in potential yields might be correlated with initial levels of development across Brazilian municipalities. For example, different pre-treatment values of income may have led to different growth paths, eventually determining diverging trends in political activities across municipalities, which could trigger the onset of land occupations as a consequence of the trade liberalization policies in 1995-1996 while not being related to the expansion of the soybean sector. To address the potential bias induced by these differences, we estimate a specification allowing for trends of pre-treatment levels of several socio-economic municipal characteristics. The included socio-economic characteristics are discussed in section 2.3. Our baseline controls are income per capita, population density, the share of the rural population, and illiteracy rate. Moreover, we include a measure of land inequality (Land Gini) and the share of the rural population who do not own land. These two variables, in particular, are important determinants of land occupations (Hidalgo et al., 2010).

Our baseline estimating equation is

$$y_{it} = \gamma_i + \delta_t + \beta \Delta \text{Soy}_i \times Post_t + \epsilon_{it} \tag{6}$$

where y_{it} is the outcome variable for municipality i in year t, ΔSoy captures differences in potential gains from investment in the soybean sector, and Post_t takes a value 1 from 1996 on, the year that concludes the trade liberalization policies. Finally, γ_i and δ_t capture municipality and time fixed effect respectively.

When we estimate the specification that included trends in municipal characteristics, we add $Y_t \mathbf{X'}_{i,1991}$ to the equation or $\text{Post}_t \times \mathbf{X'}_{i,1991}$. Y_t is a time trend, and $\mathbf{X'}_{i,1991}$ represents a vector of socioeconomic characteristics measured in 1991.

Our primary outcomes are the incidence of land occupation, the number of families involved, the hectares of land harvested in soybean, and measures of granted settlement through agrarian reform. We hypothesize that the increase in potential gains from investment in the soybean sector affected the incidence of land occupations by increasing the amount of land devoted to soybean production and therefore reducing access to the land for the local rural communities. The increased prevalence of the formal agricultural sector, by reducing the ability of the local landless to access open land, might increase the value of property rights regulation and push for actions aimed at triggering land reform in the form of settlement concessions.

We analyze the mechanisms behind our results using several sources of information. In several cases, we rely on census information available only for 1991 and 2000. In these cases, the specification in equation 6 is equivalent to the following equation in First Differences.

$$\Delta y_i = \Delta\delta + \beta \Delta \text{Soy}_i + \lambda \mathbf{X'}_{i,1991} + \Delta\epsilon_i \tag{7}$$

In our baseline specifications, we report standard errors that are robust to heteroskedasticity and clustered at the municipal level. Because our measures of potential gains are likely to be correlated across space, we provide estimates allowing for a higher level of spatial correlations of the errors (Micro-region level and Conley HAC). We further provide alternative specifications allowing for regional trends and state trends and show results for the whole of Brazil and restricting to the soybean producing regions.

2.5 Main Results

Table 42 reports our main results on the effect of increased potential gains in the soybean sector on land occupations and the number of occupying families. Column (1) shows the effect of differential productivity in soy alone. Column (2) condition on changes in maize potential yield and column (3) also includes the interaction between socioeconomic characteristics discussed in section 41 and the variable Post_t, capturing the potential discontinuous effect of socioeconomic characteristics.

First, an increase in one standard deviation in the differential productivity in soy production in a given municipality leads to an increase of around .54 percentage points in the probability of an occupation between 1996 and 2014 as compared to the period between 1988 and 1995. The number has to be compared to an average incidence of land occupation per municipality-year of 3.8%: an increase of .54 pp represents an increase of 14.2 % in the probability of experiencing an occupation. In column (2-3), we show that the effect increases both when we include State-level trends, and when we add the controls. The opposite signs of the coefficients associated with ΔSoy_i and ΔMaize_i is consistent with our hypothesis that the two crops should have the opposite effect on land occupation given their differences in terms of capital and labor composition and the requirement in terms of hectares of land exploited. Columns (3)-(6) report the same specifications where the dependent variable is the log number of families involved in land occupation per year and municipality.

Table 42: Baseline Results

	Land Occupation			Ln Number Occupying Families		
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\text{Soy}_i \times \text{Post}_t$	0.00541***	0.00661***	0.00741**	0.0444***	0.0571***	0.0651**
	(0.00129)	(0.00140)	(0.00312)	(0.0124)	(0.0134)	(0.0293)
$\Delta\text{Maize}_i \times \text{Post}_t$			-0.00794**			-0.0777***
			(0.00315)			(0.0295)
Observations	149931	149904	88047	149736	149710	87937
Mean Dep. Var.	0.0345	0.0345	0.0344	8.515	8.515	8.228
Municípios FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	.	Yes	Yes	.	Yes
State-by-Year FE	No	Yes	No	No	Yes	No
Controls	No	No	Yes	No	No	Yes
SE Cluster Level	Município	Município	Município	Município	Município	Município
Sample	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014

Notes: Land Occupation takes value 1 if at least one occupation occurs in a municipality-year. Ln Number Occupying Families is the log number of the total number of families participating in an occupation in a municipality-year. ΔSoy: difference in soy productivity under high and low input in a given municipality. ΔMaize: difference in maize productivity under high and low input in a given municipality. Post_t takes value 1 for every year from 1996 when the trade liberalization policies were passed; 0 otherwise. Mean Dep. Var. reports the average number of occupation incidence per municipality-year and the average number of occupying families for the regression samples. All regressions include municipal and year fixed effects. We allow for differential state trends in (2) and (5). Regressions (3) and (6) include controls. Standard errors clustered at the municipal level are in parenthesis, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

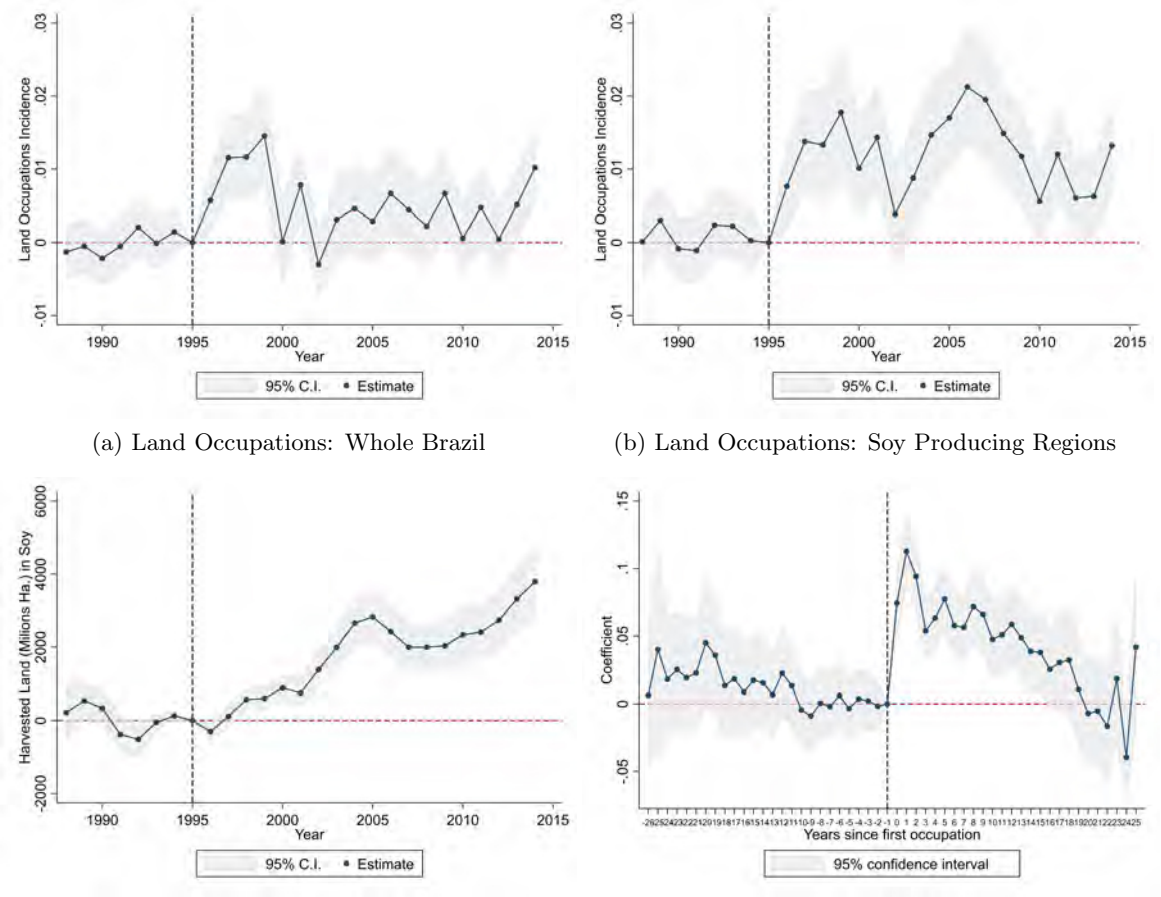
Data Source: CPT (2018); FAO (2010) and IBGE (2006).

The effect on the number of occupying families is also strong: a standard deviation increase in ΔSoy leads to around 4.4% or 11% more occupying families depending on whether we control for ΔMaize. Since the average number of occupying families is 8.324, a standard deviation increase in ΔSoy leads to almost one more occupying family on average. Column (6) shows that these effects are robust to the inclusion of pre-trends.

Figure 24 shows the timing of the effect for both the whole Brazil (a) and restricting attention to the soybean producing regions (b), the Southern, South-Eastern and Central West regions. These regions together account for 91/% of the harvested area in soybeans in 2010.[96]

[96]Regions' definition follows the IBGE (2006). These are represented in Figure B.25 in section B.2.9.2 of the Appendix.

Figure 24: Timing: Occupation, Soy Harvest, and Land Redistribution



(a) Land Occupations: Whole Brazil

(b) Land Occupations: Soy Producing Regions

(c) Soy Harvested Area

(d) Land Occupations and Redistribution

Notes: Panel (a) and (b) show the trends before and after 1995 in the relationship between ΔSoy_i and Land Occupations. Each dot represent the coefficients $\hat{\beta}_t$ from equation 5. Panel (a) report the estimates of equation 5 for the entire country, while in panel (b) we restrict the analysis to the soybean producing regions. Both regressions include municipality fixed effect, regression depicted in panel (a) also includes year fixed effect while panel (b) includes state-year fixed effect. Panel (c) shows the estimates for the same specification as in panel (b) with the harvested area in soy as dependent variable. Panel (d) show the coefficient from the following equation $\text{Settlement}_{it} = \gamma_i + \delta_t + \sum_{l=-26}^{-1} \beta_l^{\text{lead}} Y_t^l + \sum_{k=0}^{25} \beta_k^{\text{lag}} Y_t^k + \lambda Y_t \mathbf{X'}_{i,1991} + \varepsilon_{it}$, where the year before the first occupation ($l = -1$) is taken as reference point.

Data Source: CPT (2018); FAO (2010) and IBGE (2006).

Results in panel (b) and (c) of Figure 24 indicate the importance of the extent of soybean cultivation in the outbreak of land occupations. Although the effect is present since 1996 for the whole country, restricting to the soybean production areas increases both the magnitude and the persistence of the effect. Panel (c) shows the timing of the expansion of soybean cultivation. Because our information regards harvested areas, it is natural to observe a delay between the acquisition of the land, the establishment of the working conditions, and the first harvest. The estimates show a positive trend starting from 1996. The trend becomes statistically significant from 1997-1998 and

increases until 2014.

2.5.1 Land Occupation and Redistribution

This section investigates how trade liberalization affected agrarian reform and the role of occupations in the process of land redistribution. While we have shown that the expansion of soybean production induced by trade liberalization increased the likelihood of land occupations, its effect on land redistribution is unclear. On the one hand, the crop's expansion is likely to be associated with an increase in the land's value. This should induce an increase in the cost of land redistribution for the government in these municipalities. This logic is particularly relevant in the case of the settlements obtained through expropriation, when the government agency in charge of the Agrarian Reform (INCRA) pays to the expropriated land-owner the market value of the land. On the other hand, because soybean expansion increases the incidence of land occupations, this can ultimately lead to an increase in land redistribution in these areas. To explore this issue, we divide the sample of granted settlement depending on the type and means through which it was obtained. Following Rocha (2009), we divide the sample into settlements that affect the structure of property and imply actual land redistribution from those that did not. The first type (Redistributive Settlement) is associated with lots of private property, typically in densely populated areas. The second type of settlement (Non-Redistributive Settlement) is often established on public land at the agricultural frontier and in scarcely populated areas. Second, we categorize settlement obtained through the expropriation of private property. These categorizations are useful to think about the relationship between political action and land redistribution. Redistributive settlement and land expropriation are more likely to be obtained as the result of political struggle rather than non-redistributive settlements.

Because the agricultural expansion induced by the trade liberalization is likely to affect both land occupations and redistribution, we cannot sharply identify the relationship between the two. Table 43 presents a coherent picture of the effect of agricultural expansion on land redistribution and its interaction with land occupations dividing settlements depending on their characteristics. First, the results show that the correlation between occupations and settlements is about 20 times larger in the case of redistributive settlement and expropriated land with respect to non-redistributive settlements. Second, the trade liberalization shock has a non-significant and close to zero effect on the incidence of redistributive settlement and expropriation but has a precisely estimated negative effect on non-redistributive settlements.

These results suggest that, because in the case of non-reformed settlement the relationship between occupations and the land grants is looser and close to zero, the effect of the increase in the value of the land is fully captured by our variable of interest, while in the case of column (4) and (7), this is mitigated by the positive relationship between occupations and land redistribution. Finally, columns (2), (5), and (8) explore the size of the occupations. A larger group of occupiers is positively related to the settlement grant, but this effect is larger (10 times) and more precise in the cases of redistributive settlement and expropriation. The interaction terms between the difference in potential soy yield and the size of occupation are not significant, but negative in the case of non-reformed settlement and positive otherwise, reinforcing our interpretation. The estimates associated with $\Delta\text{Soy}\times$ are negative in columns (5) and (8), suggesting that when conditioning on the number of occupiers, the model better captures the direct effect of an increase in land value on redistribution. In Figure 24 panel (d), we show how the probability of a settlement evolves since the first occupation occurs. The graph clearly displays a jump immediately after the first occupation. While the increase in the probability fades away with time, before the first occupation, there seem to be no confounding patterns. Overall, these results indicate a positive relationship between land occupations and redistribution, indicating that political movement and protest affect policy-making. In section B.2.9.3 of the appendix, we show additional results indicating a negative relationship between soybean expansion and the size (area and beneficiary families) of the settlements (see Table B.52).

Table 43: Occupations and Land Redistribution

	Non-Redistributive Settlement			Redistributive Settlement			Expropriation		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ΔSoy× Post	-0.00184***	-0.00170***		0.000207	-0.000166		0.000106	-0.0000974	
	(0.000605)	(0.000591)		(0.00123)	(0.00118)		(0.00100)	(0.000947)	
Ln. Occupiers ×ΔSoy× Post		-0.000746			0.00149			0.000614	
		(0.000533)			(0.00148)			(0.00139)	
Ln. Occupiers		0.00110**			0.0137***			0.0128***	
		(0.000457)			(0.00138)			(0.00130)	
Any Occupation (3 years)			0.00344**			0.0710***			0.0658***
			(0.00156)			(0.00466)			(0.00437)
Observations	88047	87937	88128	88047	87937	88128	88047	87937	88128
Mean Dep. Var.	0.00487	0.00487	0.00487	0.0319	0.0319	0.0319	0.0241	0.0241	0.0241
Municípios FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-by-Year FE	No	No	No	No	No	No	No	No	No
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE Cluster Level	Município	Município	Município	Município	Município	Município	Município	Município	Município
Sample	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014

Notes: Non-Redistributive Settlement takes value one if in a given year-municipality at least one *assentamento* has been recognized by the INCRA and land titles have been transferred. Columns (5) and (6) are conditional on Land Redistribution being positive. In Column (5) the dependent variable is the log number of families who benefited from land redistribution in a given year-municipality. In Column (6) is the log of the area redistributed. The variable Any Occupation (3 years) takes value one if at least an occupation occurred in that year or in the previous three years. Column (4) includes a separate dummy for each of the previous years. All regressions include year and municipal FE. Means are computed for the levels of the dependent variables. Standard errors are in clustered at the municipal level , *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Data Source: CPT (2018); FAO (2010) and IBGE (2006).

2.5.2 Potential Mechanisms

In this section, we turn to the analysis of some of the potential mechanisms through which trade liberalization could have induced an increase in land occupations in municipalities with a higher difference in soy potential yield.

First, we quantify the expansion of the hectares harvested in soybean. Consistently with panel (c) of Figure 24, we find a large increase (about 30%) in the absolute number of hectares (column (6), Table 44) and an increase of 8% in the share of hectares harvested in soybean (column (7)). The two results together indicate that soybean production could have affected land occupations through two channels: the reduction of the amount of land not exploited in agribusiness and the substitution in the allocation of land between soybean and alternative crops. A decrease in the amount of non-harvested land at the municipal level might imply a reduction of the resources available to the rural poor for self-sustaining agriculture and therefore increase the value of land titles that can be acquired through occupations. In Table B.54 of the Appendix we further investigate this channel. We presents estimates for the difference between the 1991 and 2000 census showing that an increase in the land harvested in soybean[97] corresponds to an increase in the land registered as agricultural land and a decline in pasturage, forests and woods.

Moreover, the substitution between soybean and other corps can induce a decline in labor demand because of the highly capital intensive nature of soybean production.

[97]The increase information on the yearly land harvested in soybean is from surveys as opposed to the information for the 1991 and 2000 coming from the census.

This last channel seems to find empirical support in the estimates in column (2) and (3). These show a decline in the number of workers per hectares in the production of soybean of 4.3% and an increase in rural unemployment of about .64 pp. A change that corresponds to an increase of almost 20% with respect to the level of 1991. In column (4) and (5), we look at changes in the structure of land ownership. Column (4) shows an increase in the average size of farms in the top category (above 1000 ha.) of about 190 hectares for each s.d. in ΔSoy. The increase corresponds to a 7.4% change. In column (5), we see a decrease in the share of land cultivated by small farmers (between 1 and 5 Ha.) of .5 pp. Together, columns (2-7) suggest that the expansion of soybean agricultural production set in motion a process of land concentration, a reduction of demand for rural workers, and a decline in the share of small producers. In Figure B.28 of the Appendix, we explore a little more in detail the change of the distribution of land by size of the farm and show an increase at the top of the distribution. Moreover, in Table B.55 we show that municipalities with higher ΔSoy were also more likely to invest in more productive (GE) seeds.[98]

Table 44: Potential Mechanisms

	Cum. Occupations	Unemp. Share	Ln Workers per Ha.	Large Farm Size	% Small Producers	Harvested Soy (Ha.)	% Harvested Soy (Ha.)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ΔSoy	0.680***	0.637***	-0.0428**	188.2*	-0.00446**		
	(0.145)	(0.226)	(0.0217)	(104.4)	(0.00179)		
ΔMaize	-0.667***	0.0133	0.0548***	99.32	0.00465***		
	(0.144)	(0.215)	(0.0207)	(124.8)	(0.00172)		
ΔSoy × $Post_t$						3227.2***	0.0217**
						(784.4)	(0.00962)
ΔMaize × $Post_t$						-2594.5***	-0.0287***
						(840.4)	(0.00860)
Observations	2945	2944	2944	1761	2944	22581	22581
Mean Dep. Var.	0.151	3.374	-0.0281	2540.8	0.0294	8799.2	0.271
Município FE	-	-	-	-	-	Yes	Yes
Year FE	-	-	-	-	-	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Estimation	FD	FD	FD	FD	FD	FE	FE
R^2	0.0380	0.0296	0.00547	0.00984	0.0405	0.0794	0.0498
Sample	1995-2006	1991-2000	1995-2006	1995-2006	1995-2006	1988-2014	1988-2014

Note: Dependent variables: in column (1) is the difference between the cumulated occupation between 1995 and 2000 and the ones between 1988 and 1991; in column (2) is the difference between the rural unemployment share in 2000 and 2001; in column (3) is the difference between the log of rural workers per hectare between 2000 and 2001; in column (4) is the difference between the average size of a farm over 1000 ha. between 2006 and 1995; (5) is the share of land worked by producers with small plots (1-5 Ha.); in column (6) is the harvested hectares in soybean for each year between 1988 and 2014; in column (7) is the share of harvested land in soybean for each year between 1988 and 2014. Columns (1)-(5) report first difference regressions, including controls for 1991. Column (5) reports estimates for a FE model where controls are interacted with year FE. Column (5) include year and municipality FEs. All columns include the socioeconomic controls excluded fraction of landless because used as an outcome. Averages are reported for the year 1995. Standard errors are in parenthesis. Clustered at the municipal level in column (5) and robust in columns (1)-(4).

Data Sources: CPT (2018); FAO (2010) and IBGE (2006).

2.5.3 Labor Market

We further investigate the role of the labor market in Table 45. We explore the role of the labor market dynamics and adverse income shocks in the industrial sectors by exploiting the different impacts of the reduction of tariffs at the microregional level. We use the measure developed by Kovak (2013a) and operationalized by Dix-Carneiro and Kovak,

[98] In section 2.7.1, we discuss the role of Genetically Engineered seeds.

2017 in the context of labor market adjustment in Brazil. Regional Tariff Reduction (RTR_r) is weighted for the local share of industrial activities and is constructed to be more positive in regions facing larger tariff reductions. We standardize the measure to have mean 0 and standard deviation 1 for the interpretation of the results. Our findings show that the unemployment induced by trade liberalization in the manufacturing sector amplifies the soybean expansion effect. In column (1), we report the effect of RTR_r together with ΔSoy and ΔMaize on the unemployment share. We see that the difference in potential yield in maize production has zero effect, in the case of soy production the coefficient shows an effect of .13 pp., while RTR_r has an effect five times larger than ΔSoy. In columns (2-4) we show that although RTR_r has no effect per se on land occupations, it has an important amplification effect. One s.d. increase in RTR_r increases the effect of ΔSoy by almost 50% with respect to the baseline effect with an average level of tariff reduction. This evidence is consistent with two complementary hypotheses. On the one hand, the possibility that regions[99] more hardly hit by the tariff reduction suffered more from firm exits and reoriented more capital toward the agricultural sector, on the other, the possibility that these regions were unable to absorb the excess labor from the agricultural sector induced by agricultural modernization and therefore imposed additional barriers to the process of adjustment in the agricultural sector.

2.5.4 Additional Channels

In Table B.53 of the appendix, we explore the effect on the share of land by type of contract. Table B.53 shows the absence of an economically significant change in the type of contract between 1995 and 2006. Panel A captures the expansion of land by type of contract while panel B shows the change in the share of cultivated land by type of contract. Most of the land is directly cultivate by landowners (89% in 1995). Less relevant are the share of land harvested by sharecroppers (2.5%) and squatters (5%). Tenants are negligible. Land cultivated by owners expand by 4.2% each s.d. of Δ Soy while sharecropped and occupied land increase by 24 and 38%. Although large in percentage change these type of contract remains negligible and the largest expansion is in land cultivated directly by owners. This is reflected in panel B. The substitution between type of crops in the share of land cultivated is close to zero for all the categories. Overall, Table B.53 shows that change in the type of contract is not a relevant channel through which ΔSoy affected land occupations.

Finally, it is worth discussing the hypothesis that land occupations were a response to the increase in land value. Although it is likely that this mechanism plays a role in fostering the incentives to occupations, one consideration is in order. The opposite direction of the coefficients of ΔSoy and ΔMaize indicate that this channel should operate through a strong differential change in the value with high potential return from investment in soybean and maize. For example, assuming no effect passing through labor market nor land access, the change in price necessary to justify this interpretation would require an equivalent movement in the value of land per hectare in opposite direction in land with high ΔSoy and ΔMaize. Although we don't have the systematic information needed to test this hypothesis, the strong assumptions implied and the evidence so far proposed, cast doubts on the idea that this channel could be operating alone.

[99] Following Dix-Carneiro and Kovak, 2017, we perform this analysis at the microregion level.

Table 45: Trade Shocks and Unemployment

	Unemployment Share	Land Occupations		
	(1)	(2)	(3)	(4)
RTR_r	0.627***			
	(0.0612)			
$\Delta Soy_r \times Post_t$	0.130**			
	(0.0587)			
$\Delta Maize_r \times Post_t$	0.000158***			
	(0.0000352)			
$RTR_r \times Post_t$		0.00539	0.0127	0.0160
		(0.0146)	(0.0144)	(0.0148)
$\Delta Soy_r \times Post_t$			0.0621***	0.0549***
			(0.0192)	(0.0197)
$\Delta Maize_r \times Post_t$			-0.0464**	-0.0405**
			(0.0189)	(0.0190)
$RTR_r \times Soy_r \times Post_t$				0.0204*
				(0.0107)
Observations	11907	12123	12123	12123
Mean Dep. Var.	3.816	0.207	0.207	0.207
Geographic FE	-	Munic.	Munic.	Munic.
Year FE	-	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Estimation	FD	FE	FE	FE
R^2	0.106	0.0000195	0.00225	0.00296
Sample	1991-2000	1988-2014	1988-2014	1988-2014

Note: All dependent variables are computed from municipal level informations and aggregated to microregions. Dependent variables: in column (1) is the difference in the share of unemployment (over 100 points) between 1991 and 2000; in column (2-4) is a dummy for land occupations. The dependent variable is the extent of the decrease in protection from Rafael and Kovak (2017). RTR_r is the log-differences in the log of 1 plus the tariff rate from 1990 to 1995 weighted by local share of industries computed by Dix-Carneiro and Kovak, 2017 and standardized to have mean 0 and standard deviation 1. Columns 1 report first difference regressions, including controls for 1991. Column (2-4) reports estimates for a FE model where controls are interacted with year FE. Standard errors are clustered at the microregion level.

Data Sources: CPT (2018); FAO (2010) and IBGE (2006).

2.6 Organizational Capacity

The process of development and modernization can be an important cause of political and social mobilization. While economic forces lead to changes in the structure of incentives by altering the opportunity cost of violence and affect individual choices behind collective action, these do not uniformly affect the probability of observing political action. Differences in land tenancy, credit access, and insurance schemes can lead to very different outcomes in redistributive conflicts by affecting outside options. In the context of Brazilian land invasions, Hidalgo et al. (2010) have shown that land inequality and measures of insurance inherent in land tenancy contracts affect incentives to land occupations in the presence of transitory income shocks. Nonetheless, poor economic conditions, leading to extreme poverty, poor health, and low levels of human capital, can reduce individuals' ability to mobilize, by reducing their organizational focus and chances of success. In this section, we study how differences in the presence of potential leaders affect the probability of land occupation given trade liberalization. We focus on the presence of local clergymen to capture differences in the number of potential leaders. The next session clarifies the role of the Brazilian Catholic Church in fostering the organizational capacity of rural workers.

2.6.1 The Brazilian Catholic Church

> "The mission of the Church is to call all men to live as brothers overcoming all forms of exploitation, as wanted by the only God and common Father of men. Moved by the Gospel and the grace of God, we must not only listen but also assume the sufferings and anguish, the struggles and hopes of the victims of the unjust distribution and possession of land..." (CNBB, 1980)

The position of the Church with respect to the *reforma agrária* has changed over time. During the 1970s, the Church experienced the rise of a strong progressive movement within its body (Wright and Wolford, 2003). In that period, clergy and lay activists gathered with this movement creating numerous grassroots organizations to bring the Church closer to the people and to diffuse a new theological perspective. A new ideological framework rose, calling on Catholics to fight against social injustice. Against this backdrop, the question of land reform soon emerged as the central issue. The commitment of the Church to a more egalitarian redistribution of land was formalized in 1975, with the creation of the Pastoral Land Commission (CPT) to help rural workers defend their rights to farmland. The basic operational units were formed with the so-called "Basic Ecclesial Communities" (*Comunidades Eclesiales de Base*, CEBs), Bible study groups characterized by *basismo*, an ideology of grassroots democracy and popular participation. Dedicated to foment solidarity and discussions on material conditions and class consciousness among the poor, CEBs became a breeding ground of progressive social identity. In CEBs, participants could justify their struggle for land based on biblical scripture, focusing on social injustice in the here-and-now. Activists would ask "Does God want it to be this way? If not, what can we do about it?"[100]

In this context, the Church provided both the ideological justification to the use of extralegal means and, at the same time, the logistic support needed for the organization of collective action. On the one hand, the organizational capacity of the Church was put at the service of the cause, by providing resources, leadership, and coordination to otherwise unorganized landless peasants. On the other hand, the Church contributed to the Brazilian land conflict by its moral legitimization of the struggle, raising the political cost of repression. In fact, religion alleviated ideological opposition to the landless movement, hollowing allegations of its rivals that rural workers were "dangerous communists."[101]

2.6.2 Empirical Results

The identification of heterogeneous effects is complicated by the endogeneity of the presence of the Church at the municipal level. For example, it may be possible that the presence of priests in a given municipality reflects the need

[100] Interview with CPT activist Friar Wilson Tallagnol, in March 1998, in Porto Alegre (RS) (Ondetti, 2008).
[101] Interview with Darci Maschio, MST activist and member of the first Rio Grande do Sul state landless commission, in March 1998, in Ronda Alta, (RS); see Ondetti (2008).

for social services that a Church committed to social justice may be willing to provide, or even that the presence of priests is directly related to the organizational needs of local landless. To exclude reverse causality, we consider the number of priests at the municipal level in 1966, around ten years before the foundation of the CPT, and the ideological shift of the Church towards the progressive ideas incarnated in Liberation Theology.

Although not influenced by considerations related to land conflict, the presence of priests in 1966 may reflect socioeconomic characteristics of the municipality. These characteristics may persist over time and drive different patterns of land invasions, thus confounding the effect of the presence of the Church. To avoid these potential confounding effects, we control for time-trends in the pre-treatment level of socioeconomic municipal characteristics. We provide further robustness checks including a series of additional interaction terms in Tables A.7 to A.11.

We estimate the following equation

$$y_{it} = \gamma_i + \delta_t + \beta \Delta \text{Soy}_i \times Post_t + \theta \text{Priests}_{i,1966} \times Post_t + \zeta \Delta \text{Soy}_i \times \text{Priests}_{i,1966} \times Post_t + \varepsilon_{it} \quad (8)$$

where $\text{Priests}_{i,1966}$ is the number of Catholic priests per Catholic individual in municipality i in 1966. Throughout the analysis we exclude municipalities in the top 1% of the distribution of priests: these are 29 municipalities with an average number of priest of 2.2 per 1,000 Catholic with respect to an average 0.14 in the rest of the sample.[102]

Table 2.6 shows the heterogeneous effect of trade liberalization on land occupations by the share of local clergymen.

[102]Out of the 29 excluded municipalities, 4 are in the Amazonas, the largest state and agricultural frontier of Brazil, where land conflict, Church presence, and settlements are historically intertwined.

Table 46: Leaders and Collective Action

	Land Occupation			Ln Number Occupying Families		
	(1)	(2)	(3)	(4)	(5)	(6)
ΔSoy × Post	-0.0330*	0.0246	-0.00860	-0.367**	0.196	-0.0799
	(0.0176)	(0.0177)	(0.0239)	(0.168)	(0.170)	(0.226)
Priests × Post	-0.295***	-0.102**	-0.199***	-2.853***	-0.981**	-1.879***
	(0.0409)	(0.0444)	(0.0426)	(0.391)	(0.428)	(0.408)
Priests × ΔSoy × Post	0.392***	0.158*	0.265***	3.794***	1.514*	2.512***
	(0.0919)	(0.0937)	(0.0886)	(0.877)	(0.899)	(0.843)
ΔMaize × Post			-0.00503			-0.0567*
			(0.00350)			(0.0334)
Observations	77166	77112	77031	77081	77028	76946
Mean Dep. Var.	0.0331	0.0331	0.0331	7.935	7.935	7.867
Mean Priests	0.138	0.138	0.138	0.138	0.138	0.138
Municípios FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	.	Yes	Yes	.	Yes
State-by-Year FE	No	Yes	No	No	Yes	No
Controls	No	No	Yes	No	No	Yes
SE Cluster Level	Município	Município	Município	Município	Município	Município
Sample	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014

Note: Land Occupation takes value 1 if at least one occupation occurs in a municipality-year. Ln Number Occupying Families is the log number of the total number of families participating in an occupation in a municipality-year. ΔSoy: difference in soy productivity under high and low input in a given municipality normalized to be zero in the minimum and 1 in the maximum. ΔMaize: difference in maize productivity under high and low input in a given municipality normalized to be zero in the minimum and 1 in the maximum. Post takes value 1 for every year since 1996; 0 otherwise. Priests is the number of Catholic priests per 1,000 Catholic individuals. Mean Dep. Var. reports the average number of occupation incidence per municipality-year and the average number of occupying families for the regression samples. Mean Priests reports the average number of Catholic priests per 1,000 Catholic individuals for the regression samples. All regressions include municipal and year fixed effects, allowing for differential state trends in (2) and (5). Regressions (3) and (6) include controls. Standard errors are clustered at the municipal level, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Data Source: CPT (conflict), FAO-GAEZ (soy and maize potential yields), CERIS (priests and Catholic population) and IBGE (controls).

When we include the interaction between the number of priests per Catholic and our variable for differential gains from agricultural investment ($\Delta\text{Soy} \times \text{Post}_t$), we observe that the effect of ΔSoy is negative (column 1) or not statistically different from zero (column 2 and 3) in the absence of priests. This is consistent with the idea that

collective action requires organizational capacity to be performed. The coefficients associated with the number of priests before trade liberalization are largely negative, while those of the interaction terms show that the effect of agricultural modernization is increasing in the number of priests per Catholic. Column (2) includes State-by-Year FE, and column (3) shows that the estimates are robust to the inclusion of ΔMaize and a large number of covariates. Estimate in column (1) shows that the effect of ΔSoy increases by 3.5 pp. when the number of priests increases from the median (1 priest per 10,000 Catholic) to the 75^{th} percentile (1.9 per 10,000 Catholic).[103] The second panel shows that the results are consistent and larger in the case of the number of occupying families. Moving from the 50^{th} to the 75^{th} percentile doubles the number of families involved in land occupations. These results suggest an active role of the clergymen in organizing and mobilizing families to occupy land.

Table 47 shows the heterogeneous effect of agricultural modernization on land redistribution as a function of the presence of the Church. Consistently with Tables 43 and 46, we find that the presence of priests is associated with an increase in land redistribution in areas affected by the agricultural modernization. Coefficients for agricultural modernization in the absence of priests show a negative (column 1) or zero effect (columns 2 to 4) on land redistribution: this is consistent with our findings in Table 46 where agricultural modernization has no or negative effect on land occupations in the absence of organizational capacity, and with an increase in the cost of land redistribution induced by trade liberalization. Column (3) and (4), although purely suggestive, show that whether the relationship between land occupation and redistribution seems not to be affected by the local economic conditions, the presence of priests only operates as an amplifier of the economic shock, even when conditioning on land occupation. These results are consistent with a broad spectrum of actions put in place by the Church in achieving land redistribution and with a strong tie between this action and local economic conditions.

[103] This is because the $0.392 \times 0.9/10 = 0.035$, where the effect is divided by 10 because the variable priests reports the number of priests per 1,000 catholic, not 10,000.

Table 47: Land Redistribution and Leaders

	Land Redistribution			
	(1)	(2)	(3)	(4)
Priests × Post	-0.122***	-0.0361**	-0.0175	-0.0131
	(0.0131)	(0.0179)	(0.0166)	(0.0194)
Priests ×ΔSoy × Post_t	0.0824***	0.0339**	0.0284**	0.0285**
	(0.0124)	(0.0137)	(0.0129)	(0.0125)
ΔSoy × Post_t	-0.0142***	-0.00287	-0.00295	-0.00305
	(0.00265)	(0.00288)	(0.00273)	(0.00258)
Any Occupation (3 years)			0.0759***	0.0744***
			(0.00542)	(0.00621)
Any Occupation (3 years)×ΔSoy × Post_t				0.000694
				(0.00570)
Any Occupation (3 years)×Priests				0.0137
				(0.0225)
Observations	77166	69309	69309	69309
Mean Dep. Var.	0.0287	0.0286	0.0286	0.0286
Municípios FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
State-by-Year FE	No	No	No	No
Controls	No	Yes	Yes	Yes
SE Cluster Level	Município	Município	Município	Município
Sample	1988-2014	1988-2014	1988-2014	1988-2014

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Land Redistribution takes value one if in a given year-municipality at least one *asentamiento* has been recognized by the INCRA and land titles have been transferred. The variable Any Occupation (3 years) takes value one if at least one occupation occurred in that year or in the previous three years. Standard errors clustered at the municipal level are in parenthesis, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Data Source: CPT, 2018; FAO-GAEZ and IBGE.

Because the presence of priests might be correlated with confounding factors affecting the incidence of land occupations, it is possible that our estimates are picking the effect of other channels. For example, land inequality and poverty are potential drivers of both land occupations and the presence of priests. In Table B.56, we present results showing that municipal characteristics actually correlate with the presence of priests but municipality with a number of priests above the median tend to be less rural and have higher agricultural income. To address these concerns, in tables B.57 to B.61 of the Appendix, we show that our results are robust to the inclusion of a set of alternative potential mediating effects. Besides the presence of priests, other channels seem to play a role in affecting land occupations in a condition of economic distress. First, consistently with Hidalgo et al. (2010), we find that inequality has an important and positive mediating effect on land occupations. Second, fixed-rent tenure appears important in reducing land occupations in the presence of trade liberalization: this complements Hidalgo et al. (2010), suggesting that peasants who do not lose access to land are able to gain from positive income shocks, given a fixed payment to rent their plot. Third, the presence of banks is associated with land occupations, suggesting that the negative effect on rural conflict of the availability of credit for the land-poor is more than offset by the positive effect of the presence of capital-intensive agroindustry. Social spending also seems to be associated with increased land occupations, possibly reflecting an empowerment effect of occupiers on public policy, consistent with our findings on land redistribution. Lastly, the higher the share of Catholics, the lower the probability of land occupations given trade liberalization, pointing to the beneficial effect on conflict of shared norms of social peace. This result is robust to the use of both the number of priests and the share of Catholics in 1975, reinforcing our interpretation of differences in local priests as differences in organizational capacity rather than social norms.[104]

2.7 Robustness and Additional Results

2.7.1 Technical Change in Soy

Together with the increase in export incentives, soybean production was also incentivized by the commercialization in Argentina and the USA of an improved variety of soybean. This GE soy variety (Roundup Ready (RR)), because of its resistance to the herbicides glyphosate, constituted a major productive advantage with respect to traditional seeds that require labor-intensive tillage techniques for plantation (Duffy and Smith, 2001). Although not legalized and heavily debated in Brazil until 2003, a large amount of smuggling from Argentina and Uruguay has been detected since 1997.[105] In Table B.55, we show that municipality with higher ΔSoy had a higher rate of adoption of the GE seed, indicating higher incentives for agricultural investments.

2.7.2 Spatial Correlation and Microregions

Figure 23 suggests that differences in soy potential yield may be correlated across municipalities. In column 1 of Table B.49, we show that our baseline result is robust to standard errors clustered at the microregion level, a larger geographical unit than the municipality.[106] In addition, in Table B.63, we provide estimates at the microregion level.

[104] Information on the number of priests after 1975, although available, would bias our results because of the foundation of the CPT in 1975 (see section 2.6.1 for a discussion).

[105] According to the Brazilian Association of Seed Producers (ABRASEM), 10% of the soybean area in Rio Grande do Sul (around 300,000 hectares) was illegally planted with GE soy as of the 1998/99 season (Altoé et al., 2001). In 2000, around 900,000 hectares were cultivated with illegal GE soy in that state, accounting for 30% of the total (Murakawa, 2000). This information is confirmed by the US government that estimated illegal cultivation of GE soy in the South of Brazil to account for 20 to 40 percent of total soy production in 2001 (USDA, 2001). By the 2002/03 season, the year prior to legalization, 70% of soy production in Rio Grande do Sul (around 8.4 million tons) was transgenic according to official statistics of the Brazilian Ministry of Agriculture (EMBRAPA, 2003). However, smuggling was not limited to the South of Brazil: as declared in 2003 by Iwao Miyamoto, President of the Brazilian Association of Soybean Producers (*Associação Brasileira dos Produtores de Soja*, APROSOJA) "that is like the *jogo do bicho* [illegal gambling game], it is illegal, but it takes place everywhere." (Globo, 2003)

[106] As of 2014, there were 557 microregions in Brazil, each containing around 10 municipalities on average. Microregions were extinguished in 2017 and replaced by "immediate geographic regions."

Results suggest that the effect of trade liberalization is as statistically significant and as strong as in our municipal-level analysis. In Table B.62, we further provide evidence that our baseline results are unchanged if we adjust standard errors for state-level spatial correlation using the Conley-HAC matrix.

2.8 Conclusion

This paper documents a large increase in the incidence of conflict over land following the Brazilian trade liberalization of the mid-1990s. Trade liberalization eliminated tariffs on imported goods and decreased taxes on primary sector exports. These policies shifted incentives from a model of import substitution manufacture to an export-oriented agricultural sector, pushing for large investments in the rural areas. Exploiting exogenous variation in the characteristics of local municipalities, we establish a causal relationship between the potential gains form investments in the main export crop (Soybean) and the rise in redistributive conflict. Our framework allows us to establish a link between agricultural modernization and the exacerbation of redistributive conflict that is largely unexplored. Theories of development and structural transformation have debated the role of agricultural productivity in the process of development. On the one hand, a comparative advantage in agriculture can retain labor, on the other an increase in agricultural productivity due to large capital investments, might induce labor-saving innovations and even redirect flows of cumulated capital into manufacture.[107]. However, recent empirical analyses have shown the presence of important frictions in the relocation of factors. Our analysis individuates redistributive conflicts over land as a potential consequence of these frictions. Moreover, it suggests an important role for collective action in determining redistributive policies.[108]

We analyze several potential mechanisms behind our results. Our findings are consistent with the hypothesis that the enclosure of previously accessible land leads to an increase in the incentives to political mobilization and land occupations. We find that the expansion of the agribusiness in the previously unexploited region induced a concentration of the available lands, an increase in the formally harvested land, and a decline in pasturage and forests. Land occupations are a rational response to the expansion of the agro-business as it represents a way to guarantee access to the land through the request of property titles.

A second set of results shows the importance of labor market dynamics and adverse income shocks in the industrial sectors. Consistently with the opportunity cost framework, we find that potential gains in soybean (capital-intensive crop) and maize (labor-intensive crop) have opposite effects, suggesting that the composition of capital, land, and labor plays a crucial role in determining incentives to land occupations. High gains from investments in capital-intensive crops reduce the number of workers per hectare and increase rural unemployment while the opposite is true for labor-intensive crops. To better understand the role of unemployment, we analyze the interaction between tariffs' reduction and agricultural modernization. Our findings show that the unemployment induced by trade liberalization in the manufacturing sector amplifies the soybean expansion effect. This evidence is consistent with two complementary hypotheses. On the one hand, the possibility that regions[109] more hardly hit by the tariff reduction suffered more from firm exits and reoriented more capital toward the agricultural sector, on the other, the possibility that these regions were unable to absorb the excess labor from the agricultural sector induced by agricultural modernization and therefore imposed additional barriers to the process of adjustment in the agricultural sector.

Finally, this paper shows the importance of constraints in collective actions. We find that not only the Church's presence amplifies the effect of the underlying economic incentives to perform land occupations, but also that these are necessary. These results on the role of organizational capacity might help to reconcile the ambiguous results found in the literature on the role of inequality and poverty in conflict.[110] If organizational capacity is a necessary condition

[107]For references on this debate see Lewis (1954); citerosenstein1943problems; Mokyr (1976); Matsuyama (1992); Bustos et al. (2016); Bustos et al. (2020)

[108]This result is in line with a theoretical framework in which the government or elite concede redistribution when under threat of political violence (Acemoglu and Robinson, 2000; Aidt and Franck, 2015). See Acemoglu et al. (2017) for a paper assessing the effect of collective action on political rent-seeking.

[109]Following Dix-Carneiro and Kovak, 2017, we perform this analysis at the microregion level.

[110]See Ray and Esteban (2017) for a review of the literature.

for collective action to take place and organizational capacity tends to be associated with a higher level of education, literacy, and development overall, this could explain the lack of a clear relationship between inequality and conflict in the literature.

B.2.9 Appendix B

B.2.9.1 Data

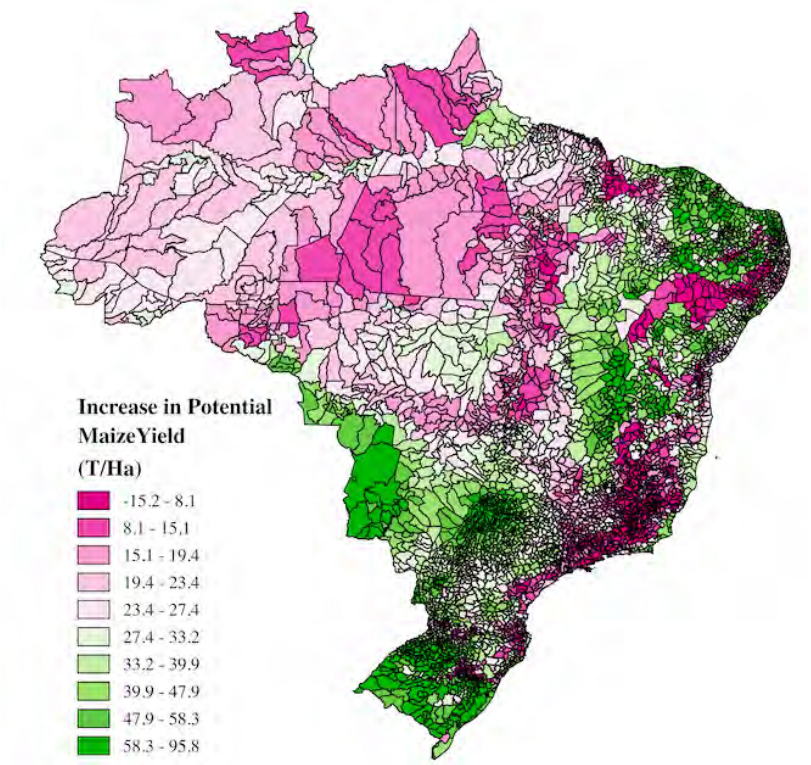
Dataluta is a project coordinated by the Agrarian Geography Laboratory (*Laboratório de Geografia Agrária*, LAGEA) of the Federal University of Uberlândia (*Universidade Federal de Uberlândia*) and the Agrarian Reform Studies, Research and Projects Center (*Núcleo de Estudos, Pesquisas e Projetos de Reforma Agrária*, NERA) of the São Paulo State University (*Universidade Estadual Paulista*). Dataluta collects data on land occupations from LAGEA, NERA and other sources. The prevalent source is the Pastoral Commission on Land (*Comissão Pastoral da Terra*, CPT), an organization within the National Conference of Bishops of Brazil (*Conferência Nacional dos Bispos do Brasil*, CNBB). Dataluta also collects information on land occupations from Research Group on Agricultural Geography and Conservation of Pantanal Biodiversity (*Grupo de Pesquisas em Geografia Agrária e Conservação da Biodiversidade do Pantanal*, GECA) of Federal University of Mato Grosso (*Universidade Federal de Mato Grosso*), GEOLUTAS of Western Paraná State University (*Universidade Estadual do Oeste do Paraná*), Labour, Space and Peasant Studies Center (*Grupo de Estudos sobre Trabalho, Espaço e Campesinato*, GETEC) of Federal University of Paraíba (*Universidade Federal da Paraíba*), Rural and Urban Studies Laboratory (*Laboratório de Estudos Rurais e Urbanos*, LABERUR) of Federal University of Sergipe (*Universidade Federal do Sergipe*), Territorial Studies Laboratory (*Laboratório de Estudos Territoriais*, LABET) of Federal University of Mato Grosso do Sul (*Universidade Federal do Mato Grosso do Sul*), Agrarian Studies Center (*Núcleo de Estudos Agrários*, NEAG) of Federal University of Rio Grande do Sul (*Universidade Federal do Rio Grande do Sul*), National Agrarian Ombudsman (*Ouvidoria Agrária Nacional*, OAN) and Land Conflict Observatory (*Observatório dos Conflitos do Campo*, OCCA) of Federal University of Espírito Santo (*Universidade Federal do Espírito Santo*).

B.2.9.2 Additional Figures

Figure B.25: Brazilian Macroregions

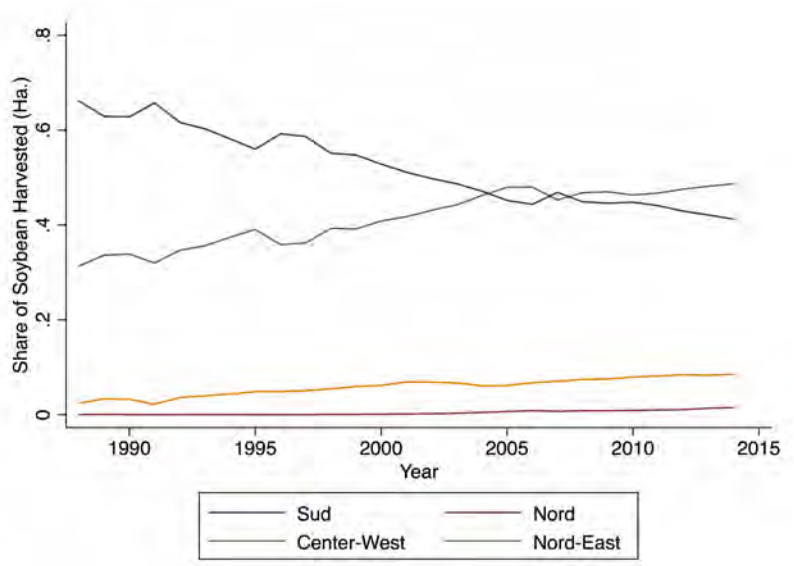
Note: Brazilian five macroregions as defined by the Brazilian Census. North (dark green), North-East (pink), Center-West (blue), South-East (light green) and South (orange).
Data Source: IBGE.

Figure B.26: Differential Maize Productivity



Note: Change in Maize Potential Yield represents the difference in maize productivity in tons per hectare under high and low inputs in a given municipality due to soil and weather characteristics. Municipalities in dark green (pink) are predicted to benefit the most from the adoption of high technology in maize production.
Data Source: FAO-GAEZ.

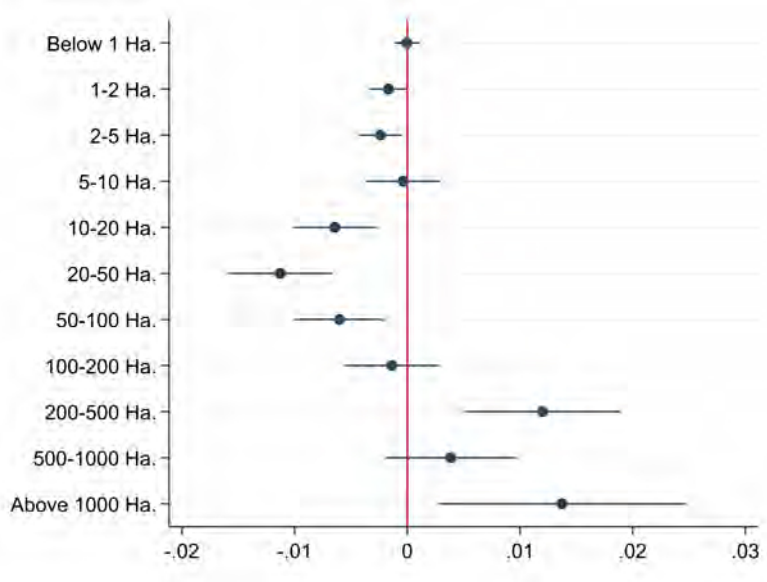
Figure B.27: Regional Share of Soybean Harvest



Notes: Time trends in the share of land harvested in soy over total cultivated land from 1988 to 2014 across macroregions (South is the sum of South and South-East)

Data Source: IBGE.

Figure B.28: Change in Share of Harvested Land by Farm Size

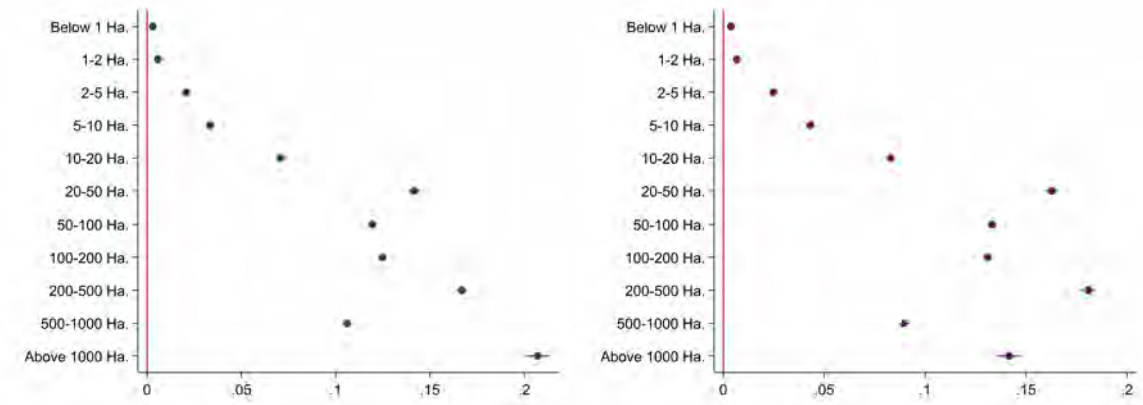


Notes: Mean share of planted land by size of agricultural firm in 1995.

Data Source: IBGE.

Figure B.29: Average Share of Land by Farm Size (1995 - 2006)

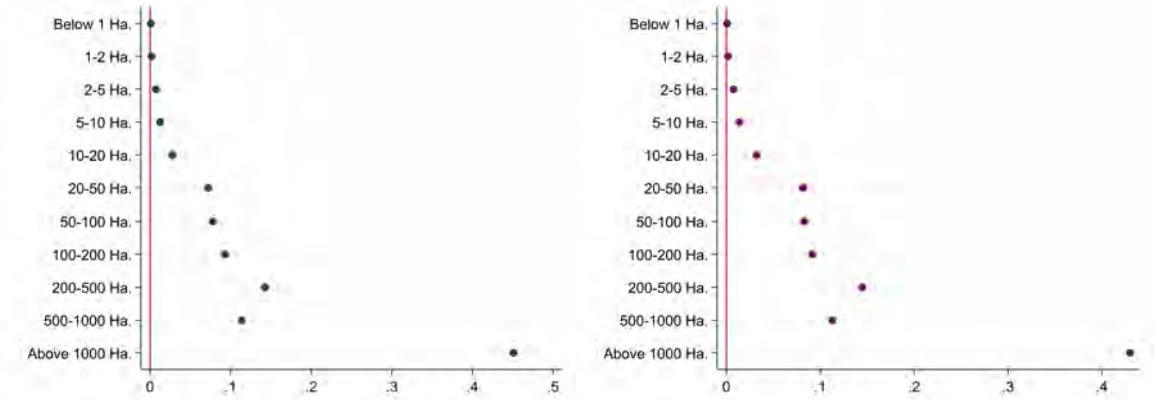
(a) 1995 (b) 2006



Notes: Average share of land by farm size at the municipal level in 1995 and 2006. *Data Source:* IBGE.

Figure B.30: Total Share of Land by Farm Size (1995 - 2006)

(a) 1995 (b) 2006



Notes: Total (for the whole country) share of land by farm size at the municipal level in 1995 and 2006. *Data Source:* IBGE.

B.2.9.3 Additional Tables

Table B.48: Summary Statistics

Sample: 1988 - 2014	*N*	Mean	SD
Land Occupations, Dichotomous	152,447	0.034	0.181
Land Occupations, Count	150,417	0.062	0.470
Occupying Families	150,222	8.478	91.254
Families per Land Occupation	4,981	148.63	212.91
Settlements, Dichotomous	152,447	0.037	0.190
Settlements, Count	152,447	0.060	0.823
Area per Settlement (Hectares)	5,706	10,018	71,336
Area of Settlements (Hectares)	152,447	374.97	13,930
Families per Settlement	5,715	153.18	342.11
Families in Settlements	152,447	5.742	72.343
Settlements by Expropriation (Proportion)	5,715	0.661	0.462
Planted Area (Hectares)	140,511	11,173	25,930
Soy Planted Area (Hectares)	42,655	10,778	27,765
Soy Planted Area (Proportion)	42,653	30.118	24.868
Log Security Budget (1991 - 2004)	54,714	-0.193	6.446
Log Social Spending (1991 - 2004)	54,714	11.271	3.856
Nonagricultural Production (Proportion, 1991 - 2003)	57,182	0.612	0.207
Rural Unemployment (1991 and 2000)	9,108	0.049	0.054
Log Rural Workers per Hectare (1996 and 2006)	7,156	-2.573	1.041
Sample: 1991	***N***	**Mean**	**SD**
Change in Soy Potential Yields (Model 1960 - 1990)	150,093	1,814	853
Change in Maize Potential Yields (Model 1960 - 1990)	150,093	3,106	1,843
Priests per Catholic (1960)	78,111	1.585	5.700
Priests per Catholic (1975)	78,057	1.111	0.883
Catholic Population (Proportion, 1960)	78,111	0.905	0.150
Catholic Population (Proportion, 1975)	78,111	0.894	0.082
Adult Rural Population	119,745	0.469	0.228
Log GDP per capita	97,119	4.517	0.588
Log Population Density	121,257	13.316	1.348
Literacy (Proportion)	121,257	0.580	0.164
Log Agricultural Income (Mean, 1991 - 1995)	122,013	7.522	1.258
Land Gini (Mean, 1992 and 1998)	121,712	0.739	0.139
Polarization	121,739	0.591	0.121
Top 10% Landowners' Share	121,008	0.538	0.139
Bottom 50% Landowners' Share	121,739	0.108	0.060
Landless Population (Proportion, 1995)	121,791	0.289	0.208
Land with Fixed-Rent Tenure (Proportion, 1995)	121,791	0.044	0.064
Land with Ownership Tenure (Proportion, 1995)	121,791	0.896	0.100
Land with Sharecropping Tenure (Proportion, 1995)	121,791	0.021	0.037
Banks (Mean, 1991, 1996 and 2000)	132,675	1.393	2.034
Income Gini	109,728	0.533	0.055
Extreme Poverty (Proportion; Mean, 1991 and 2000)	132,675	0.304	0.186
Unused Arable Land (Proportion)	121,791	0.051	0.073

Note: Variables under Sample: 1988 - 2014 are observed every year, with the exception of Security Budget and Social Spending (both observed in the 1991 - 2004 period), Nonagricultural Production (observed in the 1991 - 2003 period), Rural Unemployment (in 1991 and 2000) and Rural Workers per Hectare (in 1995 and 2006). Variables under Sample: 1991 are observed only in 1991, with the exception of Priests per Catholic and Catholic Population (in 1960 and 1975), Agricultural Income (mean from 1991 to 1995), Land Gini (mean of 1992 and 1998 as in Hoffmann, 1998), Polarization (which is a function of Land Gini), Landless and land tenures (1995/96 IBGE Agricultural Census), Banks (mean of 1991, 1996 and 2000), Extreme Poverty (mean of 1991 and 2000) and changes in potential yields (measured as in the FAO-GAEZ model using soil and weather characteristics in the 1960 - 1990 period).

Table B.49: Baseline - Microregions Clusters, Count and Intensive Margin

	Land Occupation	Land Occupation (Count)		Land Occupation (Intensive)		
	(1)	(2)	(3)	(4)	(5)	(6)
ΔSoy × Post	0.00661***	0.0146***	0.0294***	-0.344	-0.0918	0.258
	(0.00201)	(0.00323)	(0.00932)	(0.245)	(0.168)	(0.260)
ΔMaize × Post			-0.0299***			-0.860**
			(0.0107)			(0.380)
Observations	149904	149904	96930	4478	4325	2983
Mean Dep. Var.	0.0345	0.0618	0.0656	1.790	1.790	1.847
Municípios FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	.	.	Yes	Yes	.	Yes
State-by-Year FE	Yes	Yes	No	No	Yes	No
Controls	No	No	Yes	No	No	Yes
SE Cluster Level	Microregions	Município	Município	Município	Município	Município
Sample	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014

Note: The dependent variable takes value 1 if at least one occupation occurs in a municipality-year in regression (1); it counts the exact number of occupations in (2) and (3); it counts the exact number of occupations in municipality-year with at least one occupation (intensive margin) in (4). ΔSoy: difference in soy productivity under high and low input in a given municipality. ΔMaize: difference in maize productivity under high and low input in a given municipality. Post takes value 1 for every year since 1996; 0 otherwise. Mean Dep. Var. reports the mean value of the dependent variable per municipality-year for the regression samples. All regressions include municipal and year fixed effects, allowing for differential state trends in (1), (2) and (5). Regressions (3) and (6) include controls. Standard errors are clustered at the microregion level in (1) and at the municipale level in (2) to (6), *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. *Data Source:* CPT (conflict), FAO-GAEZ (soy and maize potential yields) and IBGE (controls).

Table B.50: Robustness: Underreporting of Occupation

	Land Occupation		
	(1)	(2)	(3)
ΔSoy × Post	0.00683***	0.00833***	0.0102***
	(0.00116)	(0.00129)	(0.00297)
ΔMaize × Post			-0.00769***
			(0.00294)
Observations	139968	139968	82512
Mean Dep. Var.	0.0238	0.0238	0.0243
Municípios FE	Yes	Yes	Yes
Year FE	Yes	.	Yes
State-by-Year FE	No	Yes	No
Controls	No	No	Yes
SE Cluster Level	Município	Município	Município
Sample	No Conflict	No Conflict	No Conflict

Note: The dependent variable takes value 1 if at least one occupation occurs in a municipality-year. ΔSoy: difference in soy productivity under high and low input in a given municipality. ΔMaize: difference in maize productivity under high and low input in a given municipality. Post takes value 1 for every year since 1995; 0 otherwise. Mean Dep. Var. reports the mean number of occupation incidence per municipality-year for the regression samples. All regressions include municipal and year fixed effects, allowing for differential state trends in (2). Regressions restrict the 1988-2014 sample to municipalities with no occupation between 1988-1995 (No Conflict). Standard errors are clustered at the municipal level, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
Data Source: CPT (conflict), FAO-GAEZ (soy and maize potential yields) and IBGE (controls).

Table B.51: Pre-treatment Occupation

	Land Occupation					
	(1)	(2)	(3)	(4)	(5)	(6)
ΔSoy × Post	0.00683***	0.00833***	0.0102***	-0.00898	-0.0176	-0.0179
	(0.00116)	(0.00129)	(0.00297)	(0.0134)	(0.0159)	(0.0197)
ΔMaize × Post			-0.00769***			-0.0168
			(0.00294)			(0.0190)
Observations	139968	139968	82512	9963	9882	5535
Mean Dep. Var.	0.0238	0.0238	0.0243	0.185	0.185	0.185
Municípios FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	.	Yes	Yes	.	Yes
State-by-Year FE	No	Yes	No	No	Yes	No
Controls	No	No	Yes	No	No	Yes
SE Cluster Level	Município	Município	Município	Município	Município	Município
Sample	No Conflict	No Conflict	No Conflict	Yes Conflict	Yes Conflict	Yes Conflict

Note: The dependent variable takes value 1 if at least one occupation occurs in a municipality-year. ΔSoy: difference in soy productivity under high and low input in a given municipality. ΔMaize: difference in maize productivity under high and low input in a given municipality. Post takes value 1 for every year since 1996; 0 otherwise. Mean Dep. Var. reports the mean number of occupation incidence per municipality-year for the regression samples. All regressions include municipal and year fixed effects, allowing for differential state trends in (2) and (5). Regressions (3) and (6) include controls. Regressions (1) to (3) restrict the 1988-2014 sample to municipalities with no occupation between 1988-1995 (No Conflict). Regressions (4) to (6) restrict the 1988-2014 sample to municipalities with a positive number of occupations between 1988-1995 (Yes Conflict). Standard errors are clustered at the municipal level, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
Data Source: CPT (conflict), FAO-GAEZ (soy and maize potential yields) and IBGE (controls).

B.2.9.4 Mechanism and Agrarian Reform

Table B.52: Occupations and Land Redistribution

	Land Redistribution				Ln Settled Families	Ln Settlement Area
	(1)	(2)	(3)	(4)	(5)	(6)
ΔSoy× Post$_t$	-0.0000924		-0.000872		-0.243***	-0.227**
	(0.00124)		(0.00148)		(0.0904)	(0.0932)
Any Occupation (3 years)		0.0701***	0.0701***			
		(0.00467)	(0.00471)			
Any Occupation (3 years)×ΔSoy			0.0000426			
			(0.00214)			
Occupation				0.0739***		
				(0.00742)		
Occupation t−1				0.0250***		
				(0.00641)		
Occupation t−2				0.0240***		
				(0.00650)		
Occupation t−3				0.0162***		
				(0.00598)		
Occupation t−4				0.00456		
				(0.00588)		
Observations	88047	88128	88047	88128	2613	2605
Mean Dep. Var.	0.0333	0.0333	0.0333	0.0333	132.9	11380.0
Municípios FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State-by-Year FE	No	No	No	No	No	No
Controls	Yes	Yes	Yes	Yes	Yes	Yes
SE Cluster Level	Município	Município	Município	Município	Município	Município
Sample	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014

Notes: Land Redistribution takes value one if in a given year-municipality at least one *asentamiento* has been recognized by the INCRA and land titles have been transferred. Columns (5) and (6) are conditional on Land Redistribution being positive. In Column (5) the dependent variable is the log number of families who benefited from land redistribution in a given year-municipality. In Column (6) is the log of the area redistributed. The variable Any Occupation (3 years) takes value one if at least an occupation occurred in that year or in the previous three years. Column (4) includes a separate dummy for each of the previous years. All regressions include year and municipal FE. Means are computed for the levels of the dependent variables. Standard errors clustered at the municipal level are in parenthesis, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. *Data Source:* CPT, 2018; FAO-GAEZ and IBGE.

Table B.53: Land Tenure

	Sharecropping	Rent	Owner	Occupied
	(1)	(2)	(3)	(4)
Panel A: Difference Log Hectares				
ΔSoy	0.240***	0.0230	0.0421**	0.385***
	(0.0846)	(0.0572)	(0.0171)	(0.100)
ΔMaize	-0.281***	0.0918	-0.0354**	-0.348***
	(0.0848)	(0.0574)	(0.0171)	(0.0945)
Panel B: Difference Share of Hectares				
ΔSoy	0.00596**	0.000727	-0.00918**	-0.000192
	(0.00278)	(0.00288)	(0.00426)	(0.00364)
ΔMaize	-0.00594**	-0.00394	0.00131	0.00845**
	(0.00259)	(0.00281)	(0.00410)	(0.00340)
Mean Share	0.0250	0.0413	0.892	0.0511
Observations	1885	2331	2943	2497
Estimation	FD	FD	FD	FD
Years	1995-2006	1995-2006	1995-2006	1995-2006
Controls	Yes	Yes	Yes	Yes

Dependent variables in Panel A are the difference between 1995 and 2006 in the log of hectares registered under sharecropping contract (column 1), rental contract (column 2), cultivated by the owner (column 3) and cultivated by occupiers (column 4). Panel B report the difference between 1995 and 2006 in the share of land cultivated in each category. All regressions include controls. Standard errors are in parenthesis. Clustered at the municipal level in column (5) and robust in columns (1)-(4). *Data Sources:* CPT (2018); FAO (2010) and IBGE (2006).

Table B.54: Formal Agriculture and Land Use

	Seasonal Crops (Ha.)		Pasture Land (Ha.)	
	(1)	(2)	(3)	(4)
ΔSoy	2180.2***	2323.3***	-2616.7***	-2067.6***
	(267.9)	(466.7)	(313.4)	(691.9)
ΔMaize		-746.5*		1373.7*
		(425.6)		(747.1)
Observations	4848	2913	4938	2943
Mean Dep. Var.	6928.2	6928.2	35855.6	35855.6
Município FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes
Estimation	FD	FD	FD	FD
Sample	1995-2006	1995-2006	1995-2006	1995-2006

Dependent variables: Seasonal Crops is the number of hectares used in all seasonal crops (*Labouras temporaria* in IBGE definition). Pasture Land (*Pastagens*) is the number of hectares used for pasture land, both artificial and natura *Data Sources:* CPT (2018); FAO (2010) and IBGE (2006).

Table B.55: Baseline - Adoption

	Adoption	Land Occupation			ΔOccupation
	(1)	(2)	(3)	(4)	(5)
ΔSoy	0.0304***				
	(0.00496)				
Adoption × Post		0.0326***			
		(0.00929)			
ΔSoy × Post		0.00117	0.0116***	0.0104***	
		(0.00188)	(0.00390)	(0.00331)	
ΔMaize × Post			-0.00700*	-0.00967***	
			(0.00399)	(0.00329)	
Adoption					0.888***
					(0.334)
Observations	3392	91557	91557	91584	3398
Mean Dep. Var.	0.103	0.0350	0.0350	0.0350	0.964
Geographic FE	State	Município	Município	Município	State
Year FE	.	.	.	Yes	.
State-by-Year FE	.	Yes	Yes	No	.
Controls	Yes	Yes	No	Yes	Yes
SE Cluster Level	.	Município	Município	Município	.
Sample	Δ95-06	1988-2014	1988-2014	1988-2014	Δ95-06

Note: Adoption is a dummy equal to (0) 1 if the municipality registered (no) production of GE soy by 2006. Land Occupation takes value 1 if at least one occupation occurs in a municipality-year. ΔOccupation is the difference between the total number of occupations in a given municipality in the 1996-2006 period and the total number of occupations before 1996. ΔSoy: difference in soy productivity under high and low input in a given municipality. ΔMaize: difference in maize productivity under high and low input in a given municipality. Post takes value 1 for every year since 1996; 0 otherwise. Mean Dep. Var. reports the mean municipal share of land cultivated with GE soy in 2006 and the mean number of occupation incidence per municipality-year for the regression samples. Regressions (2) to (4) include municipal fixed effects while regressions (1) and (5) state fixed effects. Regressions (2) to (4) include year fixed effects, allowing for differential state trends in (2) and (3). Regressions (1), (2), (4) and (5) include controls. Standard errors are clustered at the municipal level in regressions (2) to (4). Robust standard errors in regressions (1) and (5), *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Data Source: CPT (conflict), FAO-GAEZ (soy) and IBGE (GE soy adoption and controls).

B.2.9.5 Collective Action and Organizational Capacity

Table B.56: Municipal Characteristics and Priests Presence

	Below Median Priests	Above Median Priests	Difference
	(1)	(2)	(3)
Ln Rural Pop. (1991)	8.48	8.24	-0.242
	(0.966)	(0.833)	(0.036)
Ln Agricultural Income (1991)	7.48	7.74	0.262
	(1.547)	(1.154)	(0.055)
Land Polrization (1991)	0.61	0.62	0.005
	(0.096)	(0.125)	(0.004)
Gini (1991)	0.52	0.53	0.004
	(0.054)	(0.050)	(0.002)
Land Gini (1991)	0.78	0.76	-0.016
	(0.093)	(0.131)	(0.004)
Share of Landless (1996)	0.31	0.35	0.048
	(0.203)	(0.214)	(0.008)
Share Extreme Poverty (1996)	0.37	0.20	-0.173
	(0.182)	(0.147)	(0.007)
Ln Social Spending (1991)	10.11	10.59	0.474
	(1.908)	(1.877)	(0.072)
Share Uncultivated Land (1996)	0.06	0.03	-0.026
	(0.073)	(0.061)	(0.003)
Share Rented Land (1996)	0.04	0.06	0.022
	(0.064)	(0.071)	(0.003)
Share Owned Land (1996)	0.91	0.89	-0.021
	(0.097)	(0.098)	(0.004)
Share Sharecropping Land (1996)	0.02	0.02	0.002
	(0.041)	(0.033)	(0.001)
Observations	1466	1389	2855

Note: The table reports the mean value for each variable dividing the sample into municipalities with a number of priests per 1,000 Catholics above and below the median. Column (3) reports the standard errors.

Table B.57: Leaders and Inequality

	Land Occupation						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ΔSoy × GE	-0.0202	-0.0206	-0.00848	-0.00356	0.000927	-0.0162	0.00478
	(0.0247)	(0.0246)	(0.0250)	(0.0253)	(0.0256)	(0.0244)	(0.0259)
ΔMaize × GE	-0.00389	-0.00263	-0.00677*	-0.00733**	-0.00732**	-0.00241	-0.00801**
	(0.00347)	(0.00346)	(0.00351)	(0.00356)	(0.00372)	(0.00343)	(0.00358)
Priests × GE	-0.196***	-0.185***	-0.203***	-0.183***	-0.185***	-0.166***	-0.186***
	(0.0438)	(0.0433)	(0.0442)	(0.0450)	(0.0477)	(0.0432)	(0.0438)
Priests × ΔSoy × GE	0.255***	0.223**	0.271***	0.241**	0.240**	0.194**	0.250***
	(0.0950)	(0.0944)	(0.0951)	(0.0971)	(0.105)	(0.0946)	(0.0960)
Land Gini × GE	-0.00157						
	(0.00339)						
Land Gini × ΔSoy × GE	0.0239***						
	(0.00802)						
Polarization × GE		-0.000532					
		(0.00427)					
Polarization × ΔSoy × GE		0.0206**					
		(0.00922)					
Bottom 50% Land Share × GE			0.000340				
			(0.00351)				
Bottom 50% Land Share × ΔSoy × GE			-0.0211**				
			(0.00845)				
Top 10% Land Share × GE				0.00701*			
				(0.00424)			
Top 10% Land Share × ΔSoy × GE				0.00147			
				(0.00938)			
Extreme Poverty × GE					0.00245		
					(0.00664)		
Extreme Poverty × ΔSoy × GE					-0.00237		
					(0.00966)		
Landless Population × GE						-0.00624	
						(0.00488)	
Landless Population × ΔSoy × GE						0.0308***	
						(0.0102)	
Income Gini × GE							-0.00449
							(0.00481)
Income Gini × ΔSoy × GE							0.0167*
							(0.00936)
Observations	69282	69309	69309	69228	69336	69309	69336
Mean Dep. Var.	0.0322	0.0322	0.0322	0.0322	0.0321	0.0322	0.0321
Municípios FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE Cluster Level	Município	Município	Município	Município	Município	Município	Município
Sample	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014

Note: Land Occupation takes value 1 if at least one occupation occurs in a municipality-year. ΔSoy: difference in soy productivity under high and low input in a given municipality. ΔMaize: difference in maize productivity under high and low input in a given municipality. Post takes value 1 for every year since 1996; 0 otherwise. Priests is the number of Catholic priests per 10,000 Catholic individuals. Land Gini is a measure of the inequality in the ownership of land. Polarization measures the bimodality in the distribution of land ownership. Bottom 50% (Top 10%) Land Share measures the amount of land owned by the bottom 50% (top 10%) in the distribution of owned land. Extreme Poverty is the share of the population under the extreme poverty threshold. Landless Population is the proportion of the population with no owned land. Income Gini measures the inequality in the distribution of income. Mean Dep. Var. reports the mean number of occupation incidence per municipality-year for the regression samples. All regressions include municipal, year fixed effects and controls. Standard errors are clustered at the municipal level, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Data Source: CPT (conflict), FAO-GAEZ (soy and maize potential yields), CERIS (priests and Catholic population) and IBGE (controls and other interactions).

Table B.58: Leaders and Income

	Land Occupation		
	(1)	(2)	(3)
ΔSoy × Post	-0.0154	0.0145	-0.00423
	(0.0248)	(0.0257)	(0.0255)
ΔMaize × Post	-0.00524	-0.00804**	-0.00648*
	(0.00342)	(0.00354)	(0.00353)
Priests × Post	-0.196***	-0.143***	-0.197***
	(0.0439)	(0.0448)	(0.0439)
Priests × ΔSoy × Post	0.258***	0.163*	0.261***
	(0.0971)	(0.0979)	(0.0956)
Agricultural Income × Post	0.00364		
	(0.00704)		
Agricultural Income × ΔSoy × Post	0.00194		
	(0.0124)		
Banks × Post		0.00123	
		(0.00553)	
Banks × ΔSoy × Post		0.0203**	
		(0.0103)	
Nonagricultural Prod. (Proportion) × Post			0.00376
			(0.00408)
Nonagricultural Prod. (Proportion) × ΔSoy × Post			0.00437
			(0.00907)
Observations	69255	69336	69309
Mean Dep. Var.	0.0322	0.0321	0.0322
Municípios FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
SE Cluster Level	Município	Município	Município
Sample	1988-2014	1988-2014	1988-2014

Note: Land Occupation takes value 1 if at least one occupation occurs in a municipality-year. ΔSoy: difference in soy productivity under high and low input in a given municipality. ΔMaize: difference in maize productivity under high and low input in a given municipality. Post takes value 1 for every year since 1996; 0 otherwise. Priests is the number of Catholic priests per 10,000 Catholic individuals. Agricultural Income is the mean agricultural income from 1991 to 1995 measured as a revenue-weighted sum of the log crop yields (tons per hectare). Banks is the mean municipal number of banks in 1991, 1996 and 2000. Nonagricultural Production represents the share of the GDP of the agricultural sector. Mean Dep. Var. reports the mean number of occupation incidence per municipality-year for the regression samples. All regressions include municipal, year fixed effects and controls. Standard errors are clustered at the municipal level, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. *Data Source:* CPT (conflict), FAO-GAEZ (soy and maize potential yields), CERIS (priests and Catholic population) and IBGE (controls and other interactions).

Table B.59: Leaders and Land

	Land Occupation				
	(1)	(2)	(3)	(4)	(5)
ΔSoy × Post	-0.00405	-0.0188	0.000813	-0.00504	-0.00916
	(0.0258)	(0.0252)	(0.0253)	(0.0255)	(0.0239)
ΔMaize × Post	-0.00683*	-0.00669**	-0.00782**	-0.00652*	-0.00475
	(0.00362)	(0.00340)	(0.00353)	(0.00355)	(0.00349)
Priests × Post	-0.189***	-0.245***	-0.200***	-0.205***	-0.198***
	(0.0458)	(0.0471)	(0.0438)	(0.0434)	(0.0435)
Priests × ΔSoy × Post	0.250**	0.331***	0.286***	0.279***	0.266***
	(0.0983)	(0.100)	(0.0962)	(0.0946)	(0.0899)
Unused Arable Land × Post	0.000865				
	(0.00397)				
Unused Arable Land × ΔSoy × Post	-0.00581				
	(0.00845)				
Fixed-Rent Tenure × Post		0.0155**			
		(0.00649)			
Fixed-Rent Tenure × ΔSoy × Post		-0.0213**			
		(0.00946)			
Ownership Tenure × Post			-0.00192		
			(0.00380)		
Ownership Tenure × ΔSoy × Post			0.0111		
			(0.00756)		
Sharecropping Tenure × Post				-0.00719***	
				(0.00249)	
Sharecropping Tenure × ΔSoy × Post				-0.000409	
				(0.00554)	
Agricultural Frontier × Post					-0.000913
					(0.00405)
Agricultural Frontier × ΔSoy × Post					-0.00337
					(0.00840)
Observations	69309	69309	69309	69309	77031
Mean Dep. Var.	0.0322	0.0322	0.0322	0.0322	0.0331
Municípios FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
SE Cluster Level	Município	Município	Município	Município	Município
Sample	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014

Note: Land Occupation takes value 1 if at least one occupation occurs in a municipality-year. ΔSoy: difference in soy productivity under high and low input in a given municipality. ΔMaize: difference in maize productivity under high and low input in a given municipality. Post takes value 1 for every year since 1996; 0 otherwise. Priests is the number of Catholic priests per 10,000 Catholic individuals in 1966. Unused Arable Land is the proportion of uncultivated land over total land in 1995/96. Fixed-Rent Tenure indicates the proportion of rented land over total land in 1995/96. Ownership Tenure indicates the proportion of owned land over total land in 1995/96. Sharecropping Tenure indicates the proportion of owned land over total land in 1995/96. Agricultural Frontier is a dummy equal to 1 if the municipaliy is at the agricultural frontier in all sample years.Mean Dep. Var. reports the mean number of occupation incidence per municipality-year for the regression samples. All regressions include municipal, year fixed effects and controls. Standard errors are clustered at the municipal level, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Data Source: CPT (conflict), FAO-GAEZ (soy and maize potential yields), CERIS (priests and Catholic population) and IBGE (controls and other interactions).

Table B.60: Leaders and Public Spending

	Land Occupation	
	(1)	(2)
ΔSoy × Post	0.000960	-0.000771
	(0.0241)	(0.0337)
ΔMaize × Post	-0.00589*	-0.00868*
	(0.00351)	(0.00475)
Priests × Post	-0.184***	-0.194***
	(0.0424)	(0.0544)
Priests × ΔSoy × Post	0.231***	0.289**
	(0.0880)	(0.121)
Social Spending × Post	-0.0314*	
	(0.0168)	
Social Spending × ΔSoy × Post	0.0628*	
	(0.0321)	
Security Budget × Post		-0.00414
		(0.00304)
Security Budget × ΔSoy × Post		0.00370
		(0.00611)
Observations	76356	30317
Mean Dep. Var.	0.0329	0.0316
Municípios FE	Yes	Yes
Year FE	Yes	Yes
Controls	Yes	Yes
SE Cluster Level	Município	Município
Sample	1988-2014	1988-2014

Note: Land Occupation takes value 1 if at least one occupation occurs in a municipality-year. ΔSoy: difference in soy productivity under high and low input in a given municipality. ΔMaize: difference in maize productivity under high and low input in a given municipality. Post takes value 1 for every year since 1996; 0 otherwise. Priests is the number of Catholic priests per 10,000 Catholic individuals in 1966. Social Spending is the yearly log social spending at the municipal level in 1991 - 2004. Security Budget is the yearly log security budget at the municipal level in 1991 - 2004. Mean Dep. Var. reports the mean number of occupation incidence per municipality-year for the regression samples. All regressions include municipal, year fixed effects and controls. Standard errors are clustered at the municipal level, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Data Source: CPT (conflict), FAO-GAEZ (soy and maize potential yields), CERIS (priests and Catholic population), IPEA (municipal budgets) and IBGE (controls).

Table B.61: Leaders and Values

	Land Occupation					
	(1)	(2)	(3)	(4)	(5)	(6)
ΔSoy × Post	0.221***	0.170**	0.189**	-0.0409	-0.0229	0.0863
	(0.0854)	(0.0764)	(0.0749)	(0.0991)	(0.110)	(0.0955)
ΔMaize × Post	-0.00372	-0.00427	-0.00424	-0.00523	-0.00559	-0.00561
	(0.00347)	(0.00343)	(0.00345)	(0.00350)	(0.00348)	(0.00349)
Priests 1960 × Post	-0.181***			-0.203***		
	(0.0412)			(0.0432)		
Priests 1960 × ΔSoy × Post	0.237***			0.268***		
	(0.0861)			(0.0889)		
Share Catholic 1960 × Post	0.138***	0.0927**	0.0880**			
	(0.0503)	(0.0431)	(0.0431)			
Share Catholic 1960 × ΔSoy × Post	-0.249***	-0.177**	-0.170**			
	(0.0937)	(0.0806)	(0.0808)			
Priests 1975 × Post		-0.208***			-0.227***	
		(0.0504)			(0.0555)	
Priests 1975 × ΔSoy × Post		0.194*			0.241**	
		(0.114)			(0.122)	
Share Catholic 1975 × Post				0.00882	0.00300	0.0567
				(0.0535)	(0.0599)	(0.0523)
Share Catholic 1975 × ΔSoy × Post				0.0378	0.0362	-0.0509
				(0.109)	(0.117)	(0.108)
Observations	76869	77031	77652	76707	76869	77490
Mean Dep. Var.	0.0328	0.0328	0.0327	0.0332	0.0332	0.0331
Municípios FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
SE Cluster Level	Município	Município	Município	Município	Município	Município
Sample	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014	1988-2014

Note: Land Occupation takes value 1 if at least one occupation occurs in a municipality-year. ΔSoy: difference in soy productivity under high and low input in a given municipality. ΔMaize: difference in maize productivity under high and low input in a given municipality. Post takes value 1 for every year since 1996; 0 otherwise. Priests 1960 is the number of Catholic priests per 10,000 Catholic individuals in 1966. Priests 1975 is the number of Catholic priests per 10,000 Catholic individuals in 1975. Share Catholic 1960 is the number of Catholic individuals per inhabitant in 1966. Share Catholic 1975 is the number of Catholic individuals per inhabitant in 1975. Mean Dep. Var. reports the mean number of occupation incidence per municipality-year for the regression samples. All regressions include municipal, year fixed effects and controls. Standard errors are clustered at the municipal level, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Data Source: CPT (conflict), FAO-GAEZ (soy and maize potential yields), CERIS (priests and Catholic population) and IBGE (controls).

B.2.9.6 Robustness

Table B.62: Spatial Correlation

	Land Occupation			
	(1)	(2)	(3)	(4)
ΔSoy $\times$ Post$_t$	0.0107***	0.0107***	0.0107***	0.0107***
	(0.00282)	(0.00293)	(0.00258)	(0.00269)
ΔMaize $\times$ Post$_t$	-0.00747**	-0.00747**	-0.00747**	-0.00747**
	(0.00298)	(0.00308)	(0.00301)	(0.00311)
Observations	96930	96930	96930	96930
Municípios FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	No	No	No
Cutoffs	500Km- 5 years	500Km- 10 years	1000Km- 5 years	1000Km- 5 years

Note: The table reports the baseline estimation clustering HAC standard errors using 500 and 1000Km as distance cutoffs and 5 and 10 years as lag cutoffs , *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Data Source: CPT (conflict), FAO-GAEZ (soy and maize potential yields) and IBGE (unemployment and controls).

Table B.63: Microregions

	Land Occupation		ΔUnemployment	ΔOccupation			
	(1)	(2)	(3)	(4)	(5)	(6)	(6)
ΔSoy × Post	0.0412***	0.0520***					
	(0.0109)	(0.0178)					
ΔMaize × Post		-0.0328*					
		(0.0170)					
ΔSoy			0.264*		1.851**	3.012***	
			(0.143)		(0.717)	(0.940)	
ΔUnemployment				0.233			4.272*
				(0.175)			(2.594)
ΔMaize						-1.755**	
						(0.885)	
Observations	15039	14553	531	531	539	558	550
Mean Dep. Var.	0.207	0.206	3.493	5.126	5.072	5.052	5.104
Microregions FE	Yes	Yes	.	.	.	.	.
Year FE	.	Yes	Yes	Yes	Yes	Yes	Yes
State-by-Year FE	Yes	No	.	.	.	.	.
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes
SE Cluster Level	Microregions	Microregions	.	.	.	.	.
Sample	1988-2014	1988-2014	Δ91-00	Δ91-00	Δ91-00	Δ91-00	Δ91-00

Note: Land Occupation takes value 1 if at least one occupation occurs in a microregion-year. ΔUnemployment is the difference between the microregion share of rural unemployed in 2000 and 1991 multiplied by 100. ΔOccupation is the difference between the total number of occupations in a given microregion between 1996 and 2000 and the total number of occupations between 1988 and 1991. ΔSoy: difference in soy productivity under high and low input in a given microregion. ΔMaize: difference in maize productivity under high and low input in a given microregion. Mean Dep. Var. reports the mean value of the dependent variable. Regressions (1) and (2) include microregions fixed effects. All regressions include year fixed effects, allowing for differential state trends in (1). Regressions (2) to (7) include controls. Models in (3) to (7) are in First Difference. Standard errors are clustered at the microregion level in (1) and (2). Robust standard errors in parenthesis in (3) to (7), *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Data Source: CPT (conflict), FAO-GAEZ (soy and maize potential yields) and IBGE (unemployment and controls).

3 External Players in the Political Economy of Natural Resources

3.1 Introduction

Economic theory suggests that political instability and conflict deters private investments because of the high cost and uncertainty involved in war-zone operations. Nontheless, part of the empirical literature has shown that there are circumstances in which violent conflict may benefit the operating firms. In a seminal work, Guidolin and La Ferrara (2007) show that companies operating at the heart of the Angolan conflict experienced a drop in their cumulative abnormal returns at the end of the civil war. The authors suggest that "a price war" between the government and the rebel group over the mining rights could explain the results. Because of the conflict, immediate revenue became more valuable, shifting bargaining power in favor of firms. In Guidolin and La Ferrara (2010), the authors, using a cross-sectional analysis, reinforce their findings showing the positive effect of civil conflicts on stock market values for incumbent firms. Recently, Berman et al. (2017), renewed attention to the issue in the context of African mines. The paper shows that conflict is more likely when the mine is exploited by a foreign firm rather than a privately owned or a state-owned firm.

To explain the forces driving these patterns, I present a simple model in which the presence of an external player in the context of non-defined property rights is key. In the model, there are two domestic agents — a ruler and an opposition group — competing for power. Power gives control over the asset in question. A third party — the private sector or a colonial power — bargains with the ruler for a share of the asset. Because the bargaining power of the ruler is endogenously determined as the result of a political game against the opposition, the external player benefits from conflict inside the country. On the other hand, the opposition's incentives to fight decrease as the power of the external player increases.

The results depend on three key parameters that can be easily interpreted: the relative value of the international asset with respect to the national economy, the sensitivity of the technology of violence, and the bargaining power of the external player.

The main results show: 1) Peace, repression, and conflict arise as equilibrium outcomes ordered in the relative value of the international asset with respect to the national economy; 2) when the external player cannot (by assumption) intervene in the political game, peace, repression, and conflict depend inversely on the power of the external player; c) when the external player is allowed to intervene in the political game, its power has an inverted U-shape effect on total violence in the country.

The first result is in line with the existing empirical literature on peace, repression, and conflict. In particular, Besley and Persson (2011) estimate a model whose equilibrium outcomes are ordered in the relative value of the international asset with respect to the national economy. The rest of the results are new in the literature.

The model formalizes the *power vacuum* theory by showing that shocks to the power of the external player affect the political equilibrium in the country. Examples of such shocks are the withdrawal of colonial powers during the first decades of the nineteenth century in Latin America and after World War II in several African countries. The power vacuum created by these shifts gave rise to the conditions behind the increase in conflicts.[111] The Indo-Pakistani War, the Arab-Israeli conflict, the Nigerian Civil War (Bevan et al., 1999), and Angolan Civil War are all examples consistent with this mechanism. Other relevant examples are given by the role of externally dominated trades, such as the slave trade (Fenske and Kala, 2017) or the East Indian Company trades. The second set of results concerns the effect of external players when they participate directly in the political game. This part of the model can be thought of as a formalization of the *divide et impera* concept and is in line with the "price of war" interpretation in Guidolin and La Ferrara (2007): an external player finances a rebellion to gain easier access to the rent. Examples include external government's intervention, such as the Liberian support for the Revolutionary United Front (RUF) in Sierra Leone in 1991 or the Rwandan government's incursion into the Democratic Republic of Congo in 1998, see

[111] These wars have multiple, well-understood causes. My contribution highlights a new potential cause. More research is needed to uncover the relative importance of these several causes.

Sambanis et al. (2017) for a theoretical work; CIA-backed military interventions in support of the US corporate sector abroad (Dube et al., 2011); and direct contribution from the corporate sector to the parties engaged in the civil war (Le Billon, 2001; Human Rights Watch, 2005, and Berman et al., 2017).

The model contributes to the literature on the effect of economic shocks on conflict. Several works have been proposed that theorize and test the role of rent opportunities on conflict. Collier and Hoeffler (2001) and Dube and Vargas (2013) show the importance of the relationship between opportunity cost and returns to conflict in determining conflict equilibria. The literature on the political resource curse has expanded on this, looking at the effects of economic shocks on regime stability (Andersen and Aslaksen, 2013) and on regime type, (Tsui, 2011 and Caselli and Tesei, 2015).

Another segment of the literature on conflict has recently started to look at the problem of third parties. Most of the literature has focused on the role of leaders trying to maintain control over an ethnically or politically divided country (Acemoglu et al., 2004; Miquel and Padro-i Miquel, 2007 and De Luca et al., 2018). A less-developed part of this literature asks questions related to external interventions. Bove et al. (2016) develop a model that study the choice to interfere in a civil war in the context of oil extracting countries. Amegashie and Kutsoati (2007) look at the incentives to intervene for a third state, and Sambanis et al. (2017) study a potential conflict between ethnically divided groups highlighting the role of external intervention in determining conflict escalation and civil war.

The model here developed departs from the existing literature by focusing on external players embedded in economic relations with the country: multinational companies and colonial powers.

I contribute to the literature on civil war and natural resources by formalizing a mechanism in which third parties—both political and commercial entities—affect peace, repression, and conflicts. The model develops a simple mechanism that is able to inform a wide range of situations that involve rent-seeking and third parties. Generally, the paper sheds light on the importance of external forces in the political economy of resource extraction and civil conflict.

The model also contributes to the literature on contests by showing that when an external player is introduced within a symmetric contest, we obtain asymmetric results by distorting the incentives to fight for the rent for the two groups involved in the contest.

The rest of the paper is organized as follows. In the next session, I introduce the model and discuss the results. In section 3, I provide empirical and anecdotal discussions of the application of the two new sets of results. I look at the effect of decolonization on civil conflict and the role of corporate sector in mining conflict in Africa.Section 4 concludes.

3.2 The Model

3.3 Setup

I consider a country populated by two symmetric ethnically or politically divided groups and external player E. The external player E is the only able to extract the natural resources of the country. The internal group can be either the incumbent, I, or the opposition, O. The external player appropriates a share $1-R$ of natural resources K, while the two groups—the incumbent and the opposition—divide the remaining share of natural resources R. Under peace, domestic share R is equally divided between the incumbent and the opposition. The distribution of domestic share R, however, can be modified through conflict. Each group decides on the manpower to allocate to fighting activity x^j, given that both of them are endowed with one unit of labor. The non-fighting time, $1-x^j$, is used in the production of consumables, given a linear production technology.

Significantly, fighting for the domestic share of the rent also affects the ability of the country to appropriate rent R itself. The total size of natural resources K is divided between the domestic and external agent E, through a bargaining between the incumbent and the external agent. The relative bargaining power of the incumbent with respect to the external agent is endogenously determined by the result of the domestic contest. The stronger the incumbent *vis á vis* the opposition, the stronger the incumbent *vis á vis* the external agent. Therefore, the total share of the domestic rent R will be higher.

The game develops in two stages. In the first stage, the two domestic agents interact in a political game that determines their relative power. In the second stage, the incumbent and the external agent bargain over the natural resource rent. Once the bargaining process is over, payoffs are realized. The respective size of the investment in coercion $x^j \in [0,1]$, $j \in \{I,O\}$ determines the respective share of R through the conflict technology $p(x^I, x^O; \alpha)$. I assume a simple extension of the Tullock (1980)'s Contest Success Function (CSF) (see Amegashie, 2006 for a discussion) to describe the conflict technology.

$$p(x^I, x^O; \alpha) \equiv \frac{x^I + \alpha}{x^I + x^O + 2\alpha}, \quad \text{with} \quad \alpha > 0. \tag{9}$$

In the second stage, the incumbent and the external agent bargain over natural resource rent K. The bargaining process results in a sharing rule between the incumbent and the external agent that depends on their relative bargaining power, δ^J with $J \in \{I,E\}$, and is denoted as

$$R(\delta^I, \delta^E). \tag{10}$$

The incumbent's bargaining power is endogenously determined in the first stage as the result of the political game and is defined as

$$\delta^I \equiv p(x^{*I}, x^{*O}; \alpha), \tag{11}$$

while the external player's bargaining power δ^E is a parameter of the model.

The assumption in Equation (1) ensures the following desirable properties for the conflict technology. Unlike the standard Tullock CSF, the above specification is continuous in $x^I = x^O = 0$ and allows me to study conditions for peace (when none of the agents exert positive effort) or one-sided violence (such as repression or non-defended insurgency). This is meant to explain the role of third parties in the general political, economic spectrum, including peace, repression, and conflict. The parameter α captures how sensitive the function is to a player's effort. The share of the domestic rent is always positive, even when the player exerts zero effort, and, is increasing in α (for the player exerting the lowest effort). This property captures the fact that conflicts in developing countries with weak institutions are noisy processes. The assumption in Equation (2) reflects the interaction between external players such as multinational companies and the incumbent in countries exporting natural resources. This relationship has been studied in a classic work by Vernon (1971) and recently has been the focus of several political science studies (see Vivoda (2011)). The view that emerges from the literature is consistent with the idea that continuous renegotiation of the contract determines the relative share of the rent between the hosting government and the multinationals. I capture the bargaining power of the government as endogenously determined by its political strength. Several works support this modeling choice. McMillan et al. (2007) and Slaski (2016) both estimate the determinants of the bargaining power of the government and the multinational. Not surprisingly, the stability of the government appears as a key determinant of its bargaining power.

The game unfolds according to the following timing:

1. The incumbent and opposition are determined. The value of natural resource K and the bargaining power of external player δ^E are observed. The incumbent and the opposition simultaneously chose their coercive investment $x^J \in [0,1]$, $J \in \{I,O\}$.
2. The incumbent and the external player bargain over K and payoffs are realized.

Payoffs for the agents $\{I,O,E\}$ are respectively

$$V^I = p(x^I, x^O; \alpha) R(\delta^I, \delta^E) K + 1 - x^I \tag{12}$$

$$V^O = (1 - p(x^I, x^O; \alpha)) R(\delta^I, \delta^E) K + 1 - x^O \tag{13}$$

$$V^E = (1 - R(\delta^I, \delta^E)) K. \tag{14}$$

I maintain the following additional assumption throughout the model.

Assumption 1. $4\alpha < K \leq 4 + 4\alpha$

The assumption imposes boundaries on K to avoid cases in which the optimal investments exceed the unit. This allows me to restrict attention to interior solutions in case of conflict.

Assumption 2. *The sharing rule $R(\delta^I, \delta^E)$ is the result of a bargaining process as in Rubinstein (1982)*

I solve the problem first by looking at the optimal sharing rule between the external player and the incumbent that results from the bargaining game and then looking backward to the political game. Standard solution for the bargaining game implies that the following condition has to be satisfied in equilibrium:

$$R(x^I, x^O; \alpha; \delta^E) = \frac{1 - \delta^E}{1 - \delta^E p(x^I, x^O; \alpha)}. \tag{15}$$

3.4 Cooperation, Repression, and Conflict

There are four scenarios that can arise in the model.

Definition 1. A cooperative equilibrium is an equilibrium in which optimal efforts are $(x^{*I}, x^{*O}) = (0, 0)$.

Definition 2. A repressive equilibrium is an equilibrium in which optimal efforts are $(x^{*I}, x^{*O}) = (x^{*I}, 0)$ with $x^{*I} > 0$.

Definition 3. An equilibrium with nondefended insurgency in which optimal efforts are $(x^{*I}, x^{*O}) = (0, x^{*O})$ with $x^{*O} > 0$.

Definition 4. A conflict equilibrium where optimal efforts are $x^{*I} > 0$ and $x^{*O} > 0$.

Before proceeding to show the conditions for the different types of equilibria, let me show the following useful result:

Lemma 1. *Payoff functions V^I and V^O are both strictly concave in each player's action.*

By simple derivation, it is immediately clear that the payoff functions are strictly concave in the player's action.

$$\frac{\partial^2 V^I}{\partial^2 x^I} = \frac{2(\delta^E - 1)^2 K(\alpha + x^O)}{(\alpha(\delta^E - 2) - x^O + (\delta^E - 1)x^I)^3} < 0,$$

$$\frac{\partial^2 V^O}{\partial^2 x^O} = \frac{2(\delta^E - 1)^2 K(\alpha + x^I)}{(\alpha(\delta^E - 2) - x^O + (\delta^E - 1)x^I)^3} < 0.$$

Non-Defended Insurgency

First, I can show that a non-defended insurgency is impossible, that is $(x^{*I} = 0; x^{*O} > 0)$ cannot be an equilibrium. For a non-defended insurgency to be an equilibrium, necessary conditions are that $V^O_{x^O}(0, x^{*O}) = 0$ and $V^I_{x^I}(0, x^{*O}) \leq 0$. Where the second inequality reflects the fact that, for zero effort to be a best response, the incumbent needs not to gain from a small increase in x^I and that x^I is non-negative.

The above equality can be written as:

$$\frac{K\alpha(\delta^E - 1)^2}{(x^{*O} + (2 - \delta^E)\alpha)^2} - 1 = 0.$$

Solving for the opposition's optimal action x^{*O} leads to the following expressions

$$x^{*O} = \alpha(\delta^E - 2) + \sqrt{\alpha(\delta^E - 1)^2 K},$$

which is positive whenever the following condition is satisfied, $K > \frac{(\delta^E-2)^2\alpha}{(\delta^E-1)^2}$.

Now plugging x^{*O} into $V^I_{x^I}(0, x^{*O})$, I derive the conditions under which the incumbent's best response is to exert zero effort given the positive opposition's effort:

$$\frac{\alpha + \alpha(\delta^E - 2) + \sqrt{\alpha(\delta^E - 1)^2 K}}{\alpha(1 - \delta^E)} - 1 \leq 0.$$

The incumbent exerts zero effort if $K \leq 4\alpha$, which violates A1. This rules out the possibility of a non-defended insurgency.

Cooperative Equilibrium

Given Lemma 1, necessary and sufficient conditions for a cooperative equilibrium are $V^O_{x^O}(0,0) \leq 0$ and $V^I_{x^I}(0,0) \leq 0$. This is true because—as a consequence of the result in Lemma —each player's payoff function is strictly concave in that player' strategy when the other player' strategy is 0. Taking derivatives and substituting $x^O = x^I = 0$ in the FOCs, result in the following conditions:

$$V^I_{x^I}(0,0) = \frac{K(1-\delta^E)}{\alpha(\delta^E 2)^2} - 1,$$

$$V^O_{x^O}(0,0) = \frac{K(\delta^E - 1)^2}{\alpha(\delta^E - 2)^2} - 1.$$

Combining the two shows that necessary and sufficient condition for cooperation to be an equilibrium is

$$K \leq \frac{\alpha(\delta^E - 2)^2}{1 - \delta^E}.$$

The expression captures the idea that when the prize is too small and the external player too strong, the return from fighting it is not large enough.

Repressive Equilibrium

Necessary conditions for a repressive equilibrium are $V^O_{x^O}(x^{*I}, 0) \leq 0$ and $V^I_{x^I}(x^{*I}, 0) = 0$. Solving the FOC for the incumbent, I obtain the repressive equilibrium effort for the incumbent:

$$\text{FOC:} \quad -1 + \frac{\alpha K(1-\delta^E)}{x^I(1-\delta^E) + \alpha(2-\delta^E)} = 0,$$

$$x^{*I} = \alpha\left(-1 + \frac{1}{\delta^E - 1}\right) + \sqrt{\frac{\alpha K}{1-\delta^E}}.$$

Using x^{*I}, we have $V^O_{x^O}(x^{*I}, 0) = \frac{(1-\delta^E)\sqrt{\frac{K\alpha}{1-\delta^E}} - 2\alpha}{\alpha}$, therefore $V^O_{x^O}(x^{*I}, 0) \leq 0$ iff $K \leq \frac{\alpha 4}{1-\delta^E}$. Because repression requires positive effort for the incumbent, an additional condition is given by $x^{*I} > 0$, that is equivalent to

$$\frac{\alpha(\delta^E - 2)^2}{1 - \delta^E} > K$$

Therefore, a repressive equilibrium can exists only in the region $\frac{\alpha(\delta^E-2)^2}{1-\delta^E} < K \leq \frac{\alpha 4}{1-\delta^E}$.

Conflict Equilibrium

Consider the regions we have determined when studying the first two equilibria. An equilibrium exists and is

cooperative if $K \leq \frac{\alpha(\delta^E-2)^2}{1-\delta^E}$. I have also shown that if there exists a repressive equilibrium, it has to be in region $\frac{\alpha(\delta^E-2)^2}{1-\delta^E} < K \leq \frac{\alpha 4}{1-\delta^E}$. Consider then region $K > \frac{\alpha 4}{1-\delta^E}$. If an equilibrium exists in such a region, it cannot be cooperative, repressive, nor a non-defended insurgency: it has to be a conflict equilibrium.
The following lemma establishes the existence of an equilibrium in this game.

Lemma 2. *A pure strategy Nash equilibrium in this game always exists.*

Lemma 2 is a simple application of Theorem 1.2 in Fudenberg and Tirole (1991). To see that this is true it is sufficient to note that the strategy space $[0,1] \times [0,1]$ is a nonempty, compact, convex subset of an Euclidean space and that the payoff functions are continuous in the strategy space and by Lemma 1, quasi-concave in each player's strategy.

Therefore, because in this game there is always a pure strategy Nash equilibrium, it follows that if $K > \frac{\alpha 4}{1-\delta^E}$, then a conflict equilibrium exists.

Finally, I can show that a conflict equilibrium cannot exist in the repressive region. By Definition 4, a conflict is an interior solution of the game. Solving the FOCs, I obtain the following equilibrium actions for the players, where x_c^{*j} is the optimal effort in conflict for agent j:

$$x_c^{*I} = \frac{K}{4} - \alpha,$$

$$x_c^{*O} = \frac{K}{4}(1-\delta^E) - \alpha.$$

In any conflict equilibrium we have that $x_c^{*O} > 0$, therefore $K > \frac{4\alpha}{1-\delta^E}$. Because the repressive region is characterized by $K \leq \frac{\alpha 4}{1-\delta^E}$, it is clear that there is no conflict equilibrium in the repressive region.
This proves the existence of three types of nonoverlapping equilibria.

We can further prove the uniqueness of the equilibrium by looking at each of the subregions defined so far. Because we have seen that only one type of equilibrium can be sustained in each region, then it is enough to show that there can only be one equilibrium per type to show uniqueness. First, notice that the cooperative equilibrium is trivially unique. Second, in the repressive region, there can multiplicity of equilibria only if the incumbent may have two optimal actions given that the opposition is exerting zero effort. This is impossible because of Lemma 1. Because the incumbent's payoff is strictly concave in his own action when the opponent's action is $x^O = 0$, then there has to be a unique maximum of the payoff function when $x^O = 0$. This implies that any repressive equilibrium is unique.

To prove the uniqueness of the conflict equilibrium, it is enough to show that the payoff functions satisfy the conditions for diagonal strict concavity, as shown in the Appendix. These results can be summarized in the following theorem.

Theorem 1. *There exists a unique equilibrium of the game. The equilibrium is either cooperative or repressive or conflict. Moreover, the type of equilibrium that arises in the game is cooperative if* $K \leq \frac{\alpha(\delta^E-2)^2}{1-\delta^E}$, *repressive if* $\frac{\alpha(\delta^E-2)^2}{1-\delta^E} < K \leq \frac{\alpha 4}{1-\delta^E}$ *and conflict if* $K > \frac{\alpha 4}{1-\delta^E}$.

Theorem 1 fully characterizes the mutually exclusive equilibria of the model. For a given α the following graph shows the equilibria in the parameter space (K, δ^E) and clarifies how changes in the parameters can determine a switch from one type of equilibrium to another one.

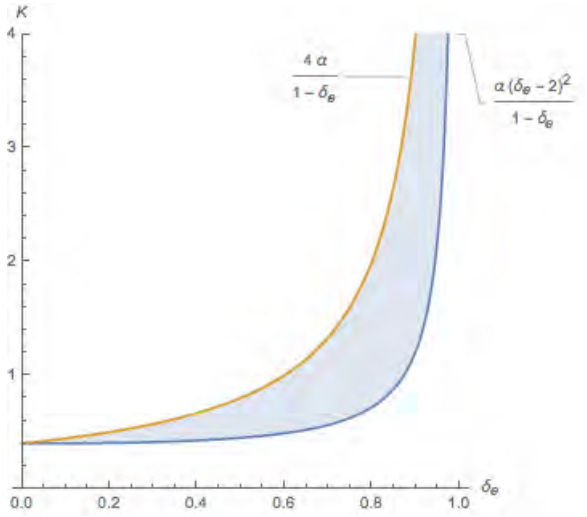


Figure 31: Equilibria Characterization, $\alpha = .1$

The region at the left of the filled region is the equilibrium space of conflict. Moving to the right, we enter the repressive equilibrium space, and finally, the cooperative equilibrium space. The results show a clear ordering of the equilibria: higher values of K lead to a change in equilibrium from cooperation to repression and conflict, the opposite is true for δ^E. The next proposition encapsulates these findings.

Proposition 2. *Cooperation, repression, and conflict are ordered in K and inversely ordered in α and δ^E.*

The first result is intuitive and consistent with the literature. Besley and Persson (2011) study and estimate a model in which rent opportunity for the government delivers exactly the same ordering property. The second result is new. The intuition behind Proposition 1 is simple: a highly powerful external player reduces the incentives to fight for the opposition because it reduces the size of the rent from the natural resources. There are several anecdotal cases that are consistent with this result. Outbreaks of civil war after the end of colonial power are frequent and can be explained by this mechanism. In the next section, I provide some application of the result. Finally, the comparative statics on α is a clear consequence of its effect on the marginal return of investment in coercion.

In the next section, I provide the comparative statics for each type of equilibrium. These comparative statics show some interesting additional features of the model.

3.5 Comparative statics

By fixing the type of equilibrium of the model, we can ask which effect the different parameters would have on the investment in coercion.

The simplest case is *cooperative equilibrium*. The optimal effort is simply zero for both agents. Changes in parameters do not affect the equilibrium effort unless the agents move to a different type of equilibrium. Conflict and repression cases are more interesting.

Conflict Equilibrium

In a conflict equilibrium, the optimal strategies for the incumbent and the opposition have the following form.

$$x_c^{*I} = \frac{K}{4} - \alpha,$$

$$x_c^{*O} = \frac{K}{4}(1-\delta^E) - \alpha,$$

Equilibrium effort for the incumbent is linear and does not depend on δ^E, while the opposition's effort is also linear but depends on δ^E. We immediately see that total effort is increasing in K and decreasing in α and δ^E. These results suggest that when an external player is constrained from intervening in the conflict, then its presence has a deterrent effect on the effort of the opposition group, but it has no effect on the effort of the incumbent. Given that in the case of conflict, only the group at the opposition internalizes the role of the external player, an increase in the bargaining power of the external player, leads to an increase in the asymmetry between the incumbent and the opposition and a more skewed distribution of resources within the country. Without the presence of the external player, the effort would be identical.

Repressive equilibrium

To obtain the repression equilibrium effort, I only need to solve the FOC evaluated in $x^{*O} = 0$, that is

$$\text{FOC:} \quad -1 + \frac{\alpha K(1-\delta^E)}{x^I(1-\delta^E) + \alpha(2-\delta^E)} = 0, \tag{16}$$

$$x_r^{*I} = \sqrt{\frac{K\alpha}{1-\delta^E}} - \frac{\alpha(2-\delta^E)}{1-\delta^E}. \tag{17}$$

We can check that x_r^{*I} is weakly decreasing in δ^E for $\frac{\alpha(\delta^E-2)^2}{1-\delta^E} < K \leq \frac{\alpha 4}{1-\delta^E}$, which are the necessary conditions for a repressive equilibrium; therefore, effort in repression is decreasing in δ^E. Finally, given the condition expressed above, the second derivative with respect to δ^E is negative. Therefore, the incumbent's effort in a repressive equilibrium is decreasing and concave in δ^E.

By the same reasoning, it is easy to check that x_r^{*I} is decreasing and concave in α and increasing and concave in K.

The comparative statics in the repressive equilibrium can be summarized in the following proposition.

Proposition 3. *The incumbent's effort in a repressive equilibrium is decreasing and concave in δ^E and α, while it is increasing and concave in K.*

Overall, the proposed analysis suggests that when an external player is present in a weakly institutionalized environment, within the context of natural resource extraction, we should expect a non symmetric level of both effort and rent appropriation even when the contending groups are symmetric, as a result of the incumbent's and opposition's distorted incentives to fight.

The possibility of a repressive equilibrium arises as a result of the distorted incentive for the incumbent to exert effort to both deter the opposition from fighting, and to gain strength at the bargaining table *vis á vis* the external player. This simple model captures two essential features of the presence of external players. First, there is the deterrent effect in conflict and the possibility of cooperation between incumbent and opposition, an equilibrium which otherwise would not be possible. Second, by providing the incumbent with additional incentives to fight, the model explains the case of repressive equilibria where no effort is exerted by the opposition.

3.6 External players and conflict intervention

Here, I analyze the effect of a transfer, from the external player to the opposition.[112] This extension is empirically motivated by the anecdotal evidence of external players' direct involvement in civil wars. A motivating example is the AngloGold Ashanti, one of the largest gold producers in the world, and its relationship with the armed group

[112] I do not allow transfer to the incumbent because in this model there are no incentives for such a transfer and in equilibrium, it would be zero.

Nationalist and Integrationist Front (FNI) in Mongbwalu, Democratic Republic of Congo (DRC). The mining company provided logistical and financial support to the armed group in exchange for protection. The relationship was beneficial for both parties: the first gaining exclusive market access, the second obtaining important political benefits (Human Rights Watch, 2005). See Le Billon (2001) for other cases of corporate sector interventions.

The following timing applies to the extended model:

1. The incumbent and the opposition are determined. The value of natural resources K and the bargaining power of the external player δ^E are observed.
   The external player chooses a transfer t to make to the opposition; the transfer is observed by both the incumbent and the opposition.
2. The incumbent and the opposition simultaneously chose their coercive investment $x^J \in [0,1]$, $J \in \{I, O\}$.
3. The incumbent and the external player bargain over K, and payoffs are realized.

To study this game I include the following assumptions:

Assumption 3.

- $\alpha = 0$
- $p(x^I, x^O; \alpha) \equiv \frac{x^I}{x^I + t * x^O}$
- $\frac{1}{\delta^E} < K < \frac{1+2\delta^E+\delta^{E\,2}}{\delta^E}$

The first point of the assumption is made for simplicity, as I am going to focus only on conflict equilibria. The second part of Assumption 3 is meant to capture the third-party intervention in the political game. I assume complementarity between the investment of the external player and the opposition. The assumption has to be thought of as capturing the relationship between an external player providing weapons or monetary transfer and an opposition whose members have to physically engage in the confrontation with the incumbent. As discussed above, this modeling choice is motivated by the evidence of logistic, military, and financial support that firms operating in war zones offer to rebel groups.

The final part is meant to guarantee the existence and uniqueness of an interior solution.

Payoff for the external player is now

$$V^E = (1 - R(\delta^I, \delta^E))K - t$$

3.7 Analysis

Given the nature of the game, I solve it by backward induction. First, I solve for the optimal strategy of the incumbent and the opposition, given the solution of the bargaining game and taking as given the transfer t. Finally, I solve the external player's problem.

Stage 2

Given the solution to the bargaining game, the incumbent and opposition simultaneously chose their investment in the coercive activity, taking t as given.

FOCs for the incumbent and the opposition are respectively:

$$\frac{(1-\delta^E)K}{(tx^O+x^I)\left(1-\frac{\delta^E x^I}{tx^O+x^I}\right)}-\frac{(1-\delta^E)Kx^I}{(tx^O+x^I)^2\left(1-\frac{\delta^E x^I}{tx^O+x^I}\right)}$$
$$-\frac{(1-\delta^E)Kx^I\left(\frac{\delta^E x^I}{(tx^O+x^I)^2}-\frac{\delta^E}{tx^O+x^I}\right)}{(tx^O+x^I)\left(1-\frac{\delta^E x^I}{tx^O+x^I}\right)^2}-1=0, \tag{18}$$

$$\frac{(1-\delta^E)Ktx^I}{(tx^O+x^I)^2\left(1-\frac{\delta^E x^I}{tx^O+x^I}\right)}-\frac{(1-\delta^E)\delta^E Ktx^I\left(1-\frac{x^I}{tx^O+x^I}\right)}{(tx^O+x^I)^2\left(1-\frac{\delta^E x^I}{tx^O+x^I}\right)^2}-1=0. \tag{19}$$

Solving the system for $x^{*I}(t,K,\delta^E)$ and $x^{*O}(t,K,\delta^E)$, I obtain the solution to the contest stage:

$$x^{*I}(t,K,\delta^E)=\frac{Kt}{(t+1)^2}, \tag{20}$$

$$x^{*O}(t,K,\delta^E)=\sqrt{\frac{(\delta^E-1)^2K^2}{(t+1)^2}}+\frac{\delta^E K}{(t+1)^2}-\frac{K}{(t+1)^2}. \tag{21}$$

Stage 1

I can now solve the external player's problem, fixing the opponent's and incumbent's strategies as a function of t. The external player chooses t to maximize

$$V^E=(1-R(\delta^I,\delta^E))K-t,$$

where

$$\begin{aligned}\delta^I &\equiv p(x^{*I}(t,K,\delta^E),x^{*O}(t,K,\delta^E),t)\\ &\equiv \frac{x^{*I}(t,K,\delta^E)}{x^{*O}(t,K,\delta^E)+tx^{*O}(t,K,\delta^E)}\\ &= \frac{K}{(t+1)^2\sqrt{\frac{(\delta^E-1)^2K^2}{(t+1)^2}}+\delta^E K},\end{aligned} \tag{22}$$

and

$$R(\delta^I,\delta^E)\equiv\delta^E\left(\frac{\sqrt{\frac{(\delta^E-1)^2K^2}{(t+1)^2}}}{K-\delta^E K}-1\right)+1.$$

The external player's problem boils down to

$$\max_t\left\{\frac{\delta^E\left(\sqrt{\frac{(\delta^E-1)^2K^2}{(t+1)^2}}+(\delta^E-1)K-t\right)+t}{\delta^E-1}\right\}. \tag{23}$$

The associated FOC reads as:

$$\frac{-\delta^E\left(\sqrt{\frac{(\delta^E-1)^2K^2}{(t+1)^2}}+t+1\right)+t+1}{(\delta^E-1)(t+1)}=0. \tag{24}$$

To show that this problem admits a solution, we verify that the second-order condition is satisfied:

$$\frac{2\delta^E \left(\frac{(\delta^E-1)^2K^2}{(t+1)^2}\right)^{3/2}}{(\delta^E-1)^3K^2} < 0, \tag{25}$$

with the sign of the expression following from $(\delta^E - 1) < 0$. Given the nature of the problem, this condition is also sufficient to deduce that there is a unique interior solution to the external player's problem.

Solving for t^* and finally for $x^{*O}(t^*, K, \delta^E)$ and $x^{*I}(t^*, K, \delta^E)$ leads to the full set of interior solutions of the game

$$t^* = \sqrt{K\delta^E} - 1, \tag{26}$$

$$x^{*I} = \frac{\sqrt{\delta^E K} - 1}{\delta^E}, \tag{27}$$

$$x^{*O} = \sqrt{\frac{(\delta^E-1)^2K}{\delta^E}} - \frac{1}{\delta^E} + 1. \tag{28}$$

To show the uniqueness of the interior equilibrium, it is sufficient to show that the best response correspondences, given the equilibrium action of the external player, are contraction mappings, but this would impose additional restrictions on the parameter space. An alternative way is to find the conditions that guarantee the diagonal strict concavity of the payoff functions, (see Rosen, 1965). The condition for diagonal strict concavity to hold (see the proof in the Appendix), is:

$$\frac{1}{\delta^E} < K$$

As this is implied by the conditions guaranteeing the interior equilibrium, I conclude that sufficient conditions for Equations 19, 20, and 21 to be the unique interior equilibrium of the game are:

$$\frac{1}{\delta^E} < k < \frac{{\delta^E}^2 + 2\delta^E + 1}{\delta^E}$$

3.8 Comparative Statics

It is immediately apparent that the incumbent's and external player's actions are increasing and concave in δ^E and K. The opponent's behavior has a non-monotonic and concave shape that arises as a consequence of the tradeoff between increasing his share of the rent $R(\delta^I, \delta^E)$ and decreasing the overall size of $R(\delta^I, \delta^E)$, through the effect on δ^I, due to increased political instability. For δ^E sufficiently small, x^{*O} is increasing because when the external player is not too strong, the marginal gains from fighting against the incumbent are higher than the marginal losses due to the increased drainage of resources implied by the weakening of the incumbent during negotiations with the external player.

Finally, consider the total effort exerted in the game, given by $T(\delta^E, k) = x^{*I} + x^{*O} \times t^*$.

$$T(\delta^E, k) = \left(\sqrt{\frac{(\delta^E-1)^2K}{\delta^E}} + 1\right)\left(\sqrt{\delta^E K} - 1\right). \tag{29}$$

Given the property of the individual behavior depicted above, it is clear that the total effort is also nonmonotonic, first increasing and then decreasing in δ^E. Consider $\frac{\partial T(\delta^E,k)}{\partial \delta^E}$

$$\frac{\partial T(\delta^E, k)}{\partial \delta^E} = \frac{\delta^E\sqrt{\frac{(\delta^E-1)^2K}{\delta^E}}\sqrt{\delta^E K} + (\delta^E - 1)K\left(\delta^E\left(2\sqrt{\delta^E K} - 1\right) - 1\right)}{2{\delta^E}^2\sqrt{\frac{(\delta^E-1)^2K}{\delta^E}}}. \tag{30}$$

We can see that $\frac{\partial T(\delta^E,k)}{\partial \delta^E} > 0$ for $\delta^E \leq \frac{1}{\sqrt{2}}$ while if $\delta^E > \frac{1}{\sqrt{2}}$ there exists a threshold level $\bar{K} = \frac{1+\delta^E+4{\delta^E}^2}{4{\delta^E}^3}$ such that:

$$\begin{cases} \frac{\partial T(\delta^E,k)}{\partial \delta^E} > 0 \text{ if } K < \bar{K} \\ \frac{\partial T(\delta^E,k)}{\partial \delta^E} < 0 \text{ if } K > \bar{K}. \end{cases} \tag{31}$$

The following proposition summarizes the previous discussion.

Proposition 4. *In the unique interior equilibrium of the game, total violence is nonmonotonic in δ^E. It is increasing for $\delta^E \leq \frac{1}{\sqrt{2}}$. If $\delta^E > \frac{1}{\sqrt{2}}$, total violence is increasing for sufficiently low value of natural resource ($K < \bar{K}$) and decreasing otherwise. Total violence is increasing in K.*

Proposition 3 formalizes the idea of *divide et impera* as a strategy through which third parties can "use" rebel groups to maintain control of local assets. First, it captures the idea that when the external player bargaining power (δ^E) is low, incentives to destabilize the country are low because the marginal return from a transfer to the opposition depends on δ^E. As δ^E increases, the marginal return increases, and so does the equilibrium level of conflict.

Second, the proposition shows that when the external player has a 'high' level of bargaining power ($K > \bar{K}$), incentives to create conflict are decreasing for a sufficiently large value of natural resource K. If the value of natural resources is too small ($K < \bar{K}$), then conflict is increasing in δ^E.

3.9 Anecdotal Evidence

3.10 Economic Shocks and Conflict

External players such as colonial powers or multinational companies have a significant influence on local economies. In the context of natural resource extraction, external players have historically played a major role in the sector, both by opening rent opportunities for the local government and acting as an external claimer on the rent. This was the role of trading companies such as the East Indian Company in the eighteenth and nineteenth centuries and is often still the role of multinational companies in the extractive sector today. How the gains that arise from the external player intervention are shared inside and outside the country depends on several elements, from the international market structure of the sector to the specific institutional and political-economic arrangement within each country. Literature in political economy has shown both theoretically and empirically the importance of institutions in shaping the political resource curse (see Mehlum et al., 2006; Cabrales and Hauk, 2010). In a context of non-defined property rights, conflict represents a likely outcome of the rent availability (Skaperdas, 1992). The model proposed here, shows that shocks on the strength of the external player can have important effects on the political equilibrium inside the country. Changes in external player's strength can be the result of several factors. First, an increase in the level of competition in the sector could reduce the company's bargaining power. Second, the increase in the sunk costs involved in non-transferable investments can shift the bargaining power over time from the multinational company to the government. Institution's quality also contributes to determine the relative strength of the company with respect to the government. Satisfactory empirical works on the matters are extremely problematic since we have very poor information about the rent sharing between multinational companies and local and/or national governments (see Laporte and de Quatrebarbes (2015) for a discussion).

3.10.1 Independence, Multinational Companies and Civil War

Independence is a drastic shock to the parameter δ^E. When the external power leaves the country, we expect a civil conflict to be more likely. In table 1 in section A.3, I propose a simple correlation that is consistent with the theory. I use data from the ICOW Colonial History Data Set, which provides information on 84 years of decolonization. I then match this information with the dataset analyzed in Fearon (2005) in a classic study on commodity exports and civil conflict. When I include a dummy for the independence year, I find suggestive evidence in favor of the

theory proposed: a shock in the presence of the colonial power does increase the probability of civil war. In the same exercise, I include a variable capturing the presence of multinational companies operating in the oil sector. The data for the construction of the variable are from the list in Luong and Weinthal (2010). The variable "Prevalence of MNC" takes a value of 0 for no Oil sector, 1 if the company is state owned, 2 if partly state owned, 3 if private and 4 if a multinational company.[113] Columns 1 and 2 suggests that the probability of civil war does increase when the colonial power retreats. Column 2 also includes the variable "Prevalence of MNC", showing that, conditional on independence, a civil war is more likely given the presence of private company (as reflected in the extension of the model). Column 3 shows that "Prevalence of MNC" even without independence, tends to be associated with a higher probability of a civil war, while in column 4 I report the interaction between civil war and multinational companies, showing that there is a positive relationship between independence and the presence of multinationals in the oil sector in determining civil wars. Although this analysis is purely suggestive, the evidence reported is in line with the theory developed in the paper.

3.10.2 Cooperating Against the External Player: The case of the Central American Republics

The political-economic trajectory of the Central American region has been characterized by the overwhelming presence of multination companies exploiting local natural resources. Under the threat of backing a revolution (Coatsworth, 1994), US companies established stable control of the local resources by the end of the 19th century. By the 1920s, the United Fruit Company had reached the control of more than 70% of the banana business — the main region' sector. Virtually all the commodities transportation facilities were owned by the companies that started their investments in Central America as part of the project for the railway development. Between the 1950s and 1960s, important changes occurred in the international structure of the banana market. Because of the development of canned fruit in the US, a large drop in the demand for the commodity induced a decline in the value of the banana production. Export prices from Costa Rica fell by 32.8% between 1956 and 1960, while declined in Honduras between 1957 and 1960 by 22% (Bulmer-Thomas, 1987). As highlighted by Bucheli (2008), such transformation determined a significant decline in the relative importance of the foreign-dominated commodity versus nationally dominated ones. This change, in line with the theory developed, represented a fundamental shift in the relationship between the governments and the multinational companies. Given the relative decrease in the importance of the revenue derived from the companies' exports and the growing strength of the multinational companies in the Central American republics, the governments started to denounce the unfair treatment. In September 1974, an agreement to create a banana export cartel was reached between the governments of Costa Rica, Guatemala, Honduras, Panama, and Colombia. The cartel was called UPEB (the acronym is Spanish for Banana Export Countries Union). The goal was to increase taxation on the multinational companies' activities, modifying land and tax concessions and increasing taxes on bananas exports.[114] While assuming this position with respect to the multinational companies, the relationship between the government and the opposition changed. This period, named Banana Wars, was characterized by unprecedented cooperation between the government and the workers in the foreign sector. Harsh confrontations started between the governments and the company (United Fruits, which was renamed United Brands, and Standard Fruits). In response to the multinational companies' initiatives to suspend exports and boycott the UPEB reforms, a unique coalition of landowners and labor unions mobilized to create a unified front against the United Brands attempts to sabotage. Panama's dictator Torrijos even promised to pay the wage of the banana workers for the entire duration of the conflict. In Honduras, President Arellano resolved to push forward the most radical agrarian reform in Honduran history by expropriating land from Standard Fruit and distributing it, to 44,700 families (Bucheli, 2008). In September 1974, thanks to cooperation between the elite and the workers, the United Brands accepted the UPEB reforms and the new political environment. By 1976, the new banana tax was in force among the UPEB members. This represented both

[113] I refer to the book for a more precise description of the coding.

[114] Central American countries were getting 11%, the multinationals received 37%, and the retailers in the consuming countries earned 19% (Lopez, 1986). See Bucheli (2008) for a reconstructs of the fight between the Central American countries and the Company.

a revenue increase from bananas and an important change in the relationship between government and opposition on the one hand and the companies on the other.

These events well represent the triangular nature of the relationship of power between government, opposition, and multinational companies analyzed in the paper. In Bucheli (2008)'s view: The alliance between the foreign firms and the totalitarian regimes lasted as long as the multinationals' operations provided a constant flow of income and economic stability. "Under those circumstances, an alliance between the government, the elite, and the company against the labor movement made sense. However, this alliance collapsed when the governments and the elite needed extra rents in times of economic crisis. If the company refused to provide this extra income, however, the anti-labor union governments were even willing to ally themselves with the labor movement in order to increase the country's rents and decrease the possibility of political turmoil. These initiatives were not a result of changes in the rulers' ideology but strategies of realpolitik."[115]

3.10.3 *Divide et Impera*

The mechanism highlighted in the model shows that when two natural resources claimants are fighting, the position of the third one is reinforced. Rebel groups controlling natural resources need the help of external players such as third countries or multinational companies to transform the natural resources into actual rent, armies, and equipment. As Le Billon (2003) puts it: "Rarely do belligerents operate resource exploitation schemes on their own, and all require business intermediaries - from local 'barefoot entrepreneurs' to international brokers and multinationals - to access commodity, financial, or arms markets".[116] In this sense, the complicity of businesses is essential to the survival of the rebel group. Proposition 3 establishes that the presence of multinationals — if not too powerful — increases the conflict effort through transfers to the rebel group. The empirical counterpart of the transfer is transactions through which companies pay "royalties" to the rebel group and guarantee access to international markets. Anecdotal evidence shows transactions between rebels and companies in war-torn economies. The most documented case is the De Beer involvement in the Angola Civil War. In Angola, diamonds were a source of revenue for the rebel group UNITA from the late 1970s to the end of the civil conflict in 2002. "UNITA first concentrated its attacks on existing mines, raiding and racketing companies as well as garimpeiros (freelance diggers). From 1983 onwards, UNITA professionalized its diamond operations, training its staff in diamond sorting and investing in mining equipment. It not only stood to benefit financially from such raids but also undermined government diamond revenues, which dropped from US$221 million in 1981 to US$33 million in 1986. From the second half of the 1980s, commercial activities were extended to a quasi-industrial scale."[117] The company's interest in maintaining control of the market made the civil war appealing. De Beer successfully imposed its position as a primary source of revenue for both the belligerents (government and opposition). For this reason, the company kept its role as an intermediary, setting its own price, and maintaining control of the international supply. Similar but less-documented cases include the relationship between De Beer and the RUF in Sierra Leone and the eastern Democratic Republic of Congo.

Another relevant case concerns the Chinese mining company, Kun Hou Mining. As noticed by Berman et al. (2017), Global Witness (2016) reports that the company is accused of bribery and collusion with the local armed group in the context of gold extraction from the Ulindi River in South Kivu, (DRC) between 2013 and 2015.

"To operate in the area and secure access, the company provided the armed groups operating on the banks of the river (the Raia Mutumboki militias) with money, rations, AK-47 rifles, and other items that allowed the militias to extort gold from artisanal miners who were extracting minerals in the same area. These activities occurred thanks to the cooperation of the local authorities of South-Kivu, which covered up the presence in the region of Kun Hou Mining and its links with local armed groups. Similarly, the governmental agency in charge of protecting local small-scale miners cooperated with the local militias to collect illegal taxes from the miners. Significantly, no formal fiscal revenue from alluvial gold mining was recorded in the South-Kivu province over the period."[118]

[115] See Bucheli (2008) p. 450.
[116] See Le Billon (2003) p. 54
[117] See Le Billon (2001) p. 67
[118] See Berman et al. (2017) p. 1594.

This is an extreme case of the mechanism depicted in the model. The company, by financing the rebel group, contributes to the creation of an alternative authority that controls the territory and thereby avoids the payment of royalties and taxes to the central government.

Finally, the empirical analysis in Berman et al. (2017) provides suggestive evidence that international companies might finance rebel groups. The authors, in a study on the effect of price shocks on conflict in Africa between 1997 and 2010, show that firms controlled by foreign companies shows a larger effect of prices shocks on conflict than other firms.

3.11 Conclusions

The observation that external players operating in war-torn economies may benefit from conflict is a puzzling one, in particular in light of theories emphasizing the relevance of the increase in operating costs and uncertainty determined by the instability inherent in conflicts.

I construct a simple model that explains this fact. The paper studies the equilibria that arise when an external player bargains with the ruler for a relative share of the country's asset. Because the bargaining power of the incumbent is endogenously determined as the result of a political game against the opposition, the external player benefits from conflict inside the country. At the same time, the presence of the external player distorts the incumbent's as well as the opposition's incentives to fight. Such distortion gives rise to a set of equilibria that would otherwise be impossible in a symmetric contest. I find that the presence of an external player can help sustain both repressive and cooperative equilibria, depending on the value of the natural resources and the bargaining power of the external player. If the value of the natural resources is high enough, the incumbent will find it more beneficial to repress the opposition, and at the same time, reinforce his bargaining power *vis á vis* the external player. But if the value of the natural resources is not high enough, then the incumbent will cooperate with the opposition against the external player.

In an extension of the model, I study the effect of transfers to the opposition made by the external player. The model shows a non-monotonic effect of the external payer's bargaining power on total violence in conflict. If the external player is powerful enough, there is no need to deploy violence because the share of the rent assured by the bargaining power is too high with respect to the marginal gain associated with fueling conflict. If instead, the bargaining power of the external player is low, then the marginal gain of the transfer will be high enough. This result rationalizes the idea that an external player can use a *divide et impera* strategy to gain higher control of domestic assets. The last sections present anecdotal evidence consistent with the findings of the model.

Overall, the paper highlights the importance of understanding the role of external players in the political economy of natural resources. To my knowledge, this is the first attempt to understand how the structure of incentives between external players, incumbents, and opposition, maps into conflict, repression, and cooperation in the context of rent-seeking economies. More empirical work is needed to understand these important relationships.

C.3.12 Appendix C

To show the uniqueness of the interior equilibrium, it is sufficient to show that the best response correspondences, given the equilibrium action of the external player, are contraction mappings, but this imposes additional restrictions on the parameter space. An alternative way is to find the conditions that guarantee the diagonal strict concavity of the payoff functions (see Rosen, 1965).

C.3.12.1 Uniqueness of Conflict Equilibrium

To see that uniqueness holds, consider the Jacobian Matrix $J(x)$ and its transformation $U(x)$:

$$J(x) = \begin{pmatrix} \frac{\partial^2 V^I(.)}{\partial^2 x^I} & \frac{\partial^2 V^I(.)}{\partial x^O \partial x^I} \\ \frac{\partial^2 V^O(.)}{\partial x^O \partial x^I} & \frac{\partial^2 V^O(.)}{\partial^2 x^O} \end{pmatrix} =$$

$$U(x) \equiv (J(x) + J(x)^T) =$$

$$\begin{pmatrix} -\frac{4(\delta^E-1)^2 K(\alpha+x^I)}{(-\alpha(\delta^E-2)+x^O-\delta^E x^I+x^I)^3} & \frac{4(\delta^E-1)^2 K(\alpha+x^O)}{(\alpha(\delta^E-2)+(\delta^E-1)x^I-x^O)^3} \\ \frac{4(\delta^E-1)^2 K(\alpha+x^O)}{(\alpha(\delta^E-2)+(\delta^E-1)x^I-x^O)^3} & \frac{4(\delta^E-1)^2 K(\alpha+x^O)}{(\alpha(\delta^E-2)-x^O+(\delta^E-1)x^I)^3} \end{pmatrix}$$

Sufficient conditions for diagonal strict concavity of the payoff functions are given by the conditions under which the matrix $U(x)$ is negative definite. These conditions are satisfied for the entire parameter space.

C.3.12.2 Uniqueness of the Equilibrium in the Extended Model

To see that conditions for diagonal strict concavity to hold are $K > 1$ and $\frac{1}{K} < \delta^E$, consider the following transformation of the Jacobian Matrix, $J(x)$:

$$U(x) \equiv (J(x) + J(x)^T) \equiv$$

$$\begin{pmatrix} \frac{4(\delta^E-1)^2 K\left(\sqrt{\delta^E K}-1\right)^2 x^I}{\left(-\sqrt{\delta^E K}x^O+x^O+(\delta^E-1)x^I\right)^3} & \frac{(\delta^E-1)\delta^E K\left(\sqrt{\delta^E K}-1\right)\left(\left(\sqrt{\delta^E K}-1\right)x^O+(\delta^E-1)x^I\right)}{\left(\left(\sqrt{\delta^E K}-1\right)x^O-\delta^E x^I+x^I\right)^3} \\ \frac{(\delta^E-1)\delta^E K\left(\sqrt{\delta^E K}-1\right)\left(\left(\sqrt{\delta^E K}-1\right)x^O+(\delta^E-1)x^I\right)}{\left(\left(\sqrt{\delta^E K}-1\right)x^O-\delta^E x^I+x^I\right)^3} & -\frac{4(\delta^E-1)^2 K\left(\sqrt{\delta^E K}-1\right)x^O}{\left(\left(\sqrt{\delta^E K}-1\right)x^O-\delta^E x^I+x^I\right)^3} \end{pmatrix}$$

Sufficient conditions for diagonal strict concavity of the payoff functions are given by the conditions under which the matrix $U(x)$ is negative definite. These are

$$\frac{1}{\delta^E} < K$$

C.3.12.3 War onset, Independence and MNCs

Table C.64: War onset, Independence and MNCs

	(1) War onset C/Y	(2) War onset C/Y	(3) War onset C/Y	(4) War onset C/Y
Independence	1.952**	3.139***		
	(0.789)	(0.986)		
Gdp per Capita	-0.000412***	-0.000138	-0.000150	-0.000142
	(0.000113)	(0.000126)	(0.000129)	(0.000131)
Log(population)	0.360***	0.439*	0.403	0.401
	(0.129)	(0.247)	(0.250)	(0.258)
Fuel export / Gdp	6.832***	8.427**	8.397**	8.323**
	(1.561)	(3.578)	(3.452)	(3.536)
Primary Commodity Export	15.48**	6.513	6.577	6.059
	(6.373)	(7.613)	(7.694)	(7.734)
(Primary Commodity Export)^2	-33.53**	-20.28*	-19.79*	-19.92
	(15.13)	(11.95)	(11.53)	(12.45)
Region	0.0100	-0.118	-0.129	-0.116
	(0.104)	(0.190)	(0.183)	(0.191)
Fractionalization	-0.000147	-0.0000187	-0.0000138	0.00000359
	(0.0000910)	(0.000154)	(0.000156)	(0.000155)
Ethnic Dominance	0.308	0.687	0.741	0.673
	(0.311)	(0.624)	(0.599)	(0.647)
Population geog disp	-1.679*	-0.744	-0.622	-0.688
	(0.949)	(1.468)	(1.434)	(1.491)
Exports % Gdp	-0.0308	-0.0246	-0.0272	-0.0246
	(0.0201)	(0.0357)	(0.0357)	(0.0353)
Prevalence of MNC		0.378**	0.380*	0.313*
		(0.168)	(0.200)	(0.186)
Prevalence of MNC=4 × Independence				3.708***
				(1.229)
Constant	-6.524***	-8.745**	-8.316**	-8.213**
	(1.766)	(3.853)	(3.889)	(4.000)
Observations	3832	1099	1099	1099
N Wars	78	17	.	17
N Independence	84	30	30	30

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The independent variable is a dummy for War onset in a given year. All controls are from Fearon (2005). Independence takes value 1 in the year of independence for a given country. The variable is from the ICOW Colonial History Data Set (Hensel and Mitchell, 2007). Information from Multinational Companies are from Luong and Weinthal (2010). All the regressions are logit models. Robust standard errors are in parenthesis.

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